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Scandinavia's Iron Ore Reserve Estimated at 4,600,000,000 Tons,
By Olin R. Kuhn

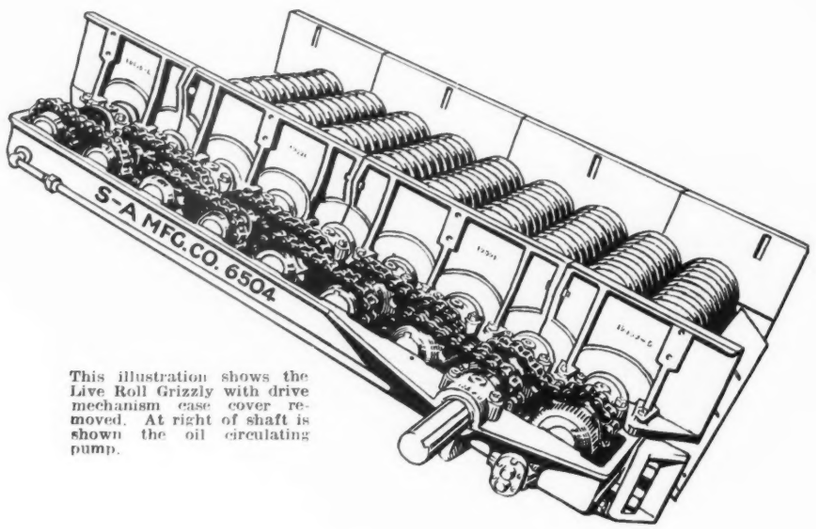
Improving Flotation Results at the Rising Star Concentrator,
By H. S. Gieser

Concreting the Morning Shaft,
By J. Fred Johnson

Mining Black Diamonds in the Piranhas District of Brazil,
By Arthur S. Bandler

Shipping Mount Lyell copper from Macquarie Harbor, Tasmania, to the refinery at Sydney

S-A "Live Roll Grizzly"



This illustration shows the Live Roll Grizzly with drive mechanism case cover removed. At right of shaft is shown the oil circulating pump.

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Write for Bulletin No. 149 which describes the Live Roll Grizzly

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Utah, Premier Copper Mine

UTAH, today, can be ranked as the world's premier copper mine. This statement is made advisedly: the purpose of mining is to earn money; and Utah is the most profitable copper mine in existence. Others may boast bigger reserves of ore, lower operating costs, or larger current production; but for making money for its shareholders Utah stands alone on a peak. Utah is submerged from the Wall Street point of view because Kennecott owns 95 per cent of its shares; but Kennecott without Utah would be like a handsome automobile with five of its eight cylinders missing fire.

What makes Utah great? Certainly not rich ore. The report for the second quarter, just at hand, shows that the average grade of the ore concentrated was 0.97 per cent copper, close to the leanest ever treated anywhere. The character of the ore deposit is not such as to give any great inherent advantage in mining over many others; nor does the character of the ore itself present any decided advantages over many others in the matter of beneficiation.

It is fair to say that a vital factor is able management —business, engineering and technical. The large organization functions with remarkable smoothness. The management is progressive. Any responsible individual who thinks that he can demonstrate a way to cut costs, whether by displacing steam shovels with 300-ton electric shovels or introducing an apparently trifling improvement in the concentrator, gets a hearing. And effort on the part of the company's engineers and metallurgists to effect economies is never relaxed. The current report shows that in spite of a lower production—decreased, by the way, to help the statistical position of the metal—and a lower grade of ore, the recovery in the concentrator was increased from 87.64 to 90.17 per cent and the production cost per pound of copper was reduced from 7.9 to 7.6c. This includes depreciation of plant and equipment, and all fixed and general expenses, together with a small credit for precious metals. Sometimes it happens that a company is forced into herculean effort to cut costs so that it may continue to operate. All the more credit is due when a company already prosperous strives successfully to improve results. Congratulations are extended to the organization in Utah, under the inspiring leadership of the general manager, L. S. Cates.

Fashion Into the Breach!

FALL MODELS of a leading Paris couturière exhibit a decided penchant for metallics! Metal thread is used throughout in sport and daytime frocks, and, in afternoon and evening apparel, metallic-thread embroidery supplies most of the embellishment! Certainly this is aid from an unexpected source, and comes at a time when the mining industry may justly hope for a faithful observance of the dictates of a leader on the part of the lesser lights in the world of fashion. To hope that fashion may decree coats of mail wrought in platinum, gold, and silver is probably not yet justified but if a small portion of the poundage of base-metal wear adorning the average African native is borne in precious metals by the civilized women of the world, the current markets of these last-named metals should improve.

"Depressing" Lead Prices.

A BONA FIDE LETTER from a reputable engineer in Montana, discussing the price of lead, appears on page 300 of this issue. His name has not been signed, although he intended it should be, because we consider the premises to be untrue and the deductions unsound. The only reason for publishing the letter and then criticising it is the fact that numerous others, engaged in mining in the West, are suffering under similar misapprehension. The correspondent advances the following propositions:

1. That the leading interests, by which he means the large smelting and refining companies, are deliberately depressing the market price of lead, and are responsible for the recent serious decline.

2. That, whereas the leading interests think that the sufferers are the owners of the small lead mines, the real victims are the manufacturers and ultimate consumers of products containing lead.

3. That the smelting and refining companies ought to forego the selfish advantage that they are gaining from the lower price levels in an altruistic desire to promote the public welfare. He calls upon the interests to "worry not over the miner [who presumably is able to take care of himself—Ed.], but rather have consideration for industry and the ultimate consumer."

Assuming for the moment that propositions (1) and (2) are tenable, what can be said of (3)? An appeal to the smelting and refining companies to help their friend the miner would have some logic. Whether the miner recognizes it or not, the smelter cannot thrive unless the miner is reasonably prosperous. Especially in view of the strong competition for ores by smelting companies, the stimulation of mine activity is necessary if smelter operations are to be profitable. Consequently, such an appeal would be directed at the ultimate self-interest of the smelting companies. But to appeal to them on the ground that they should look out for the general public, in a matter that cannot possibly concern anything more vital than the consumers' pocket book, seems ridiculous.

Coming now to proposition (2) and assuming for the moment that (1) is true: it is contended that a low price for lead will grievously hurt industry and the ultimate consumer. Certainly each of these groups is going to be better off if all the lead needed can be obtained at six and a half cents than if ten cents had to be paid. That seems self-evident. Probably the solicitation of the correspondent for the public is based on the theory that the time will come when six and a half cents will not

warrant the mining of enough lead to supply the demand. That time possibly will come. But there never has been a protracted shortage of any widely produced commodity that was so serious that the consumer could not meet his requirements if he was willing to pay the price. Such lead as is available will be mined when prevailing prices warrant. In the long run the price paid by the public will bear a definite relation to the cost of production, and the cost of exploiting any given deposit is likely to grow less rather than more, as time goes on. The dear public is not going to suffer because of the artificial depression of the price level. Far greater danger lies in the artificial maintenance of high prices by monopolistic control.

How, now, about proposition (1): that the smelting and refining companies artificially depress the price of the metal? This notion has gained currency because of the policy of important selling agencies of trying to prevent wide and rapid fluctuations in the price. When many consumers start to inquire for more than their normal current needs, under the impression that a sharp advance is impending, sellers frequently endeavor to restrain the buying wave and do not advance prices so rapidly as they might. The reason is that no one, unless it be speculative buyers, will gain by a sharp advance that experience has proved will be followed by a disastrous decline. Miners, smelters, and consumers alike gain by reasonable steadiness in the market.

The reasons that the leading interests do not artificially depress the price of lead over periods of any considerable duration are two: first, they could not if they wanted to; and, second, they would not if they could, because it would not be to their own advantage. If the production and marketing of virtually all of the world's supply of lead were in the hands of a huge trust it would be practicable for a brief interval to make the price as low as was desired. The motive might be to eliminate a small competitor. But there are too many important factors, both domestic and foreign, with too many divergent interests, to make any concerted program of manipulation in the price of lead conceivable.

There remains to answer the idea that it benefits the big companies to maintain the price at a low level. Among the reasons why this is not so are the following: Each of the big custom smelting companies—A. S. & R., Anaconda, American Metal, and United States S. R. & M.—have important lead mines of their own either in the United States or in Mexico. Profits from these mines fluctuate with the price of lead. A second point is that to make the maximum operating profit from a smelting plant it must be kept at as nearly full capacity as possible. A good lead market means large receipts of custom ores and spells better profits for the smelting company. A third point is that smelting contracts usually provide that the smelting company's margin fluctuates up or down with the price of lead. Smelter and miner in effect are partners in prosperity or adversity. It may be said with the utmost assurance that each of the "interests" would rather see lead fluctuate between nine and ten cents than between six and seven cents.

In the second paragraph of his letter the correspondent shows how the producers in recent years expanded output to meet increased demand. In the very next breath (Paragraph 3) he appears to contradict himself by saying that "the world's supply by no means kept pace with the demand." He was, of course, right in the first place. The high price was the cause; increased production the effect. But once production had gained momentum it continued to expand; it became greater than demand; and the price declined. Fortunately, lower prices presently will stop the oversupply, and higher prices are to be expected. It is economic law, operating as best it may under the limitations imposed by practical considerations of production and consumption, and not the machinations of the interests, that is responsible for lead prices that are lower than they were a year ago.

Carolina Gold

ASSAYS do not always tell the whole story. "Your gold-rush country is not the wild and woolly West or Far North, but aristocratic old North Carolina," says J. H. Bryson, state geologist; "and it has deposits far richer than the Alaskan deposits. The trick is, North Carolina ore is assayed at $2.18 per ton, compared with $1.28 in Alaska." The cry of gold in North Carolina has been heard from time to time ever since the gold miners of the South forsook that part of the country for the richer diggings in California some three-quarters of a century ago. There is gold in "them thar southern hills," without doubt, but, generally speaking, the ores seem not rich enough, nor extensive enough, to make mining profitable. Doubtless there are exceptions, but scouts for the mining companies have not had much luck in finding promising prospects.

The assays quoted by Mr. Bryson do not sound very attractive for either Alaska or North Carolina. Just what ore he had in mind is not evident, but the comparison might have been made to look even more favorable to North Carolina if he had selected Alaska Juneau's ore as representative, for that, as shipped from the mine, contained only 75c. in gold last year. An operating profit of something like $175,000 was made, however, which is considerably more than any one is making, or is likely to make, in North Carolina on $2.18 ore.

But why speak of such mean figures anyway? A doctor—an M.D. doctor—writes from the Tarheel state to say that on his 297-acre farm he has found ore that assays 0.29 per cent—no less—gold, and $\frac{1}{10}$ per cent silver. The assays must be right because they were made by a firm of gold and silver refiners whose address he gives. The owner of the farm says, "I am writing you for advice and further information. We want the place developed at once."

The advice may well come from us, but the further information will have to come from North Carolina, and it is badly needed. Until it is forthcoming, the only advice that can be given, based on the information furnished, is to stop talking and mount machine guns at suitable intervals around the boundaries of the farm to keep trespassers and high-graders off, for $1,400 ore is not found very often even up in northern Ontario, where the stuff grows tall and rank.

Arsenic Needed for Weevil Control

THE IMMEDIATE FUTURE of the arsenic market looks better than it has looked for some time. Stocks are down to but little more than two months' requirements, production is at a comparatively low ebb, and the boll weevil in the Southern cotton fields is actively springing around on all six feet. In fact, government reports indicate

that the pest is likely to be more in evidence than for many years, and, obviously, measures must be taken for its control.

It will be remembered that a few years ago, when it was thought so much arsenic would be needed for weevil fighting, the price soared to ten or fifteen cents. Since then, most of the weevils seem to have been æstivating, which, in case one has no unabridged dictionary handy, means hibernating in the summer time. At any rate, they have been more of an aid in preventing overproduction of cotton than a serious menace. But now perhaps the story will be different. Poison will be needed and calcium arsenate seems still to be indicated. The Chemical Warfare Service of the U. S. Army has been diverting a part of its efforts from finding means to kill off human beings, to more civilized though similar work against the boll weevil, and has apparently found nothing quite so good as the chemical mentioned, though sodium and barium fluosilicates were quite satisfactory. Liquid poisons were not so efficient, as the weevil is not a hard drinker; he prefers to pick up the particles of arsenical dust on his moist snout and swallow them, without regard for consequences.

The price of arsenic, or, properly speaking, arsenious oxide, for that is the commercial article, has for months been unpleasantly low—about 3½c. delivered. Producers were glad to get rid of it at any price, for it was a by-product that was more of a liability than an asset. The price has now advanced to 4c. as specifications on contracts have increased; not much improvement in price, it is true, but a step in the right direction, and if the demand materializes as the boll weevil has done, the price may again reach a point such that arsenical ores will have some value for their arsenic content. Unfortunately, as the demand increases, an enlarged foreign production must be taken care of too, for arsenic is on the free list. There is, of course, no good economic reason for this in a tariff-protected country, but there is an excellent political reason. Ask any Southern Congressman. The cotton raiser must get his insecticide as cheaply as possible, regardless of the miner, for the farmer's vote looms large.

An International Machinery Exhibit

MAKERS of mining and metallurgical equipment might find in the Leipzig Fair an opportunity to display their products to good advantage. This international trade fair is unique in several ways. It has been held for centuries. It takes place twice a year—in the spring and fall—for a period of a single week. Experience has shown that this plan makes it possible to transact business with the greatest economy of time and money. The fall fair will last from Aug. 28 to Sept. 3 and many American firms have arranged to display their manufactured products. More than 7,000 exhibits will be on display. The exposition is strictly an industrial exchange, and mere sightseers are excluded.

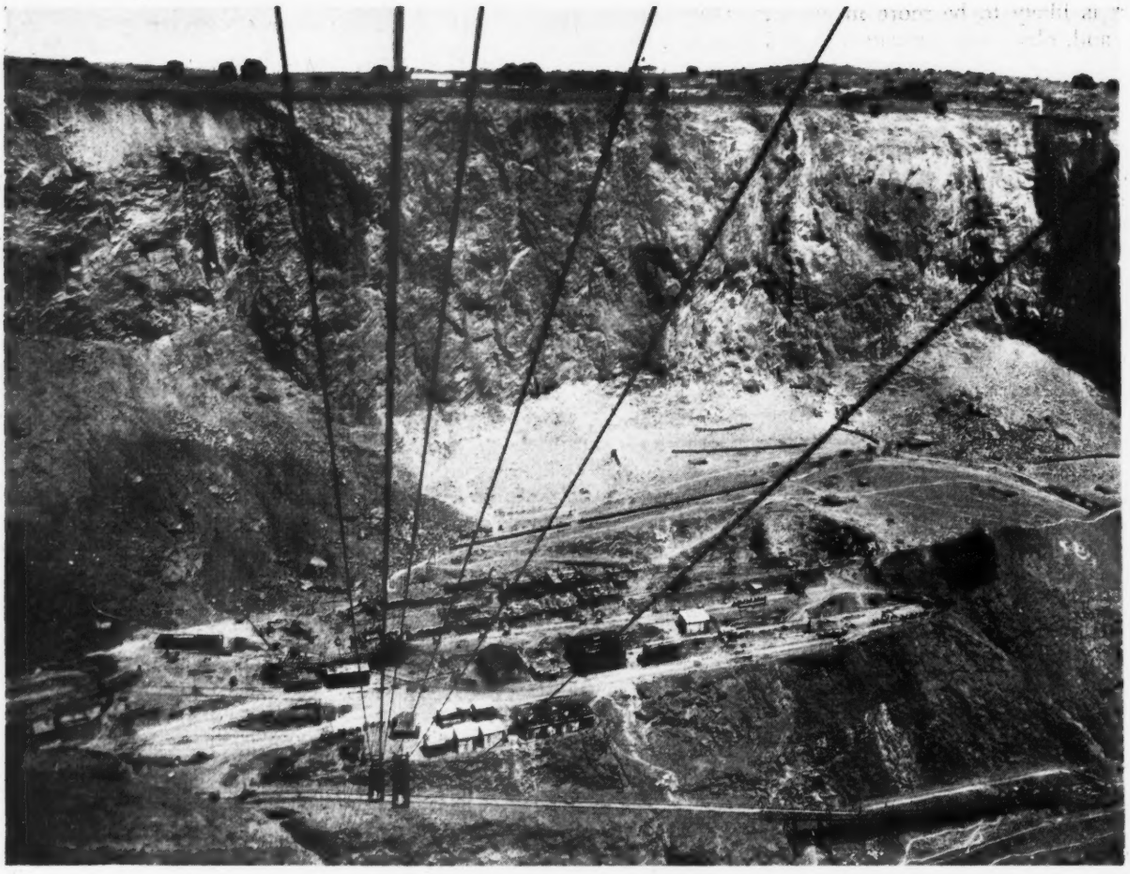
Since the mining industry has taken on an international aspect, it might be advantageous for the makers of the equipment and supplies that it consumes to exhibit their manufactures in this international fair, though it is, of course, too late to arrange for representation at the current exhibit. American companies might find it a valuable aid in developing the European market, which is now becoming more and more important.

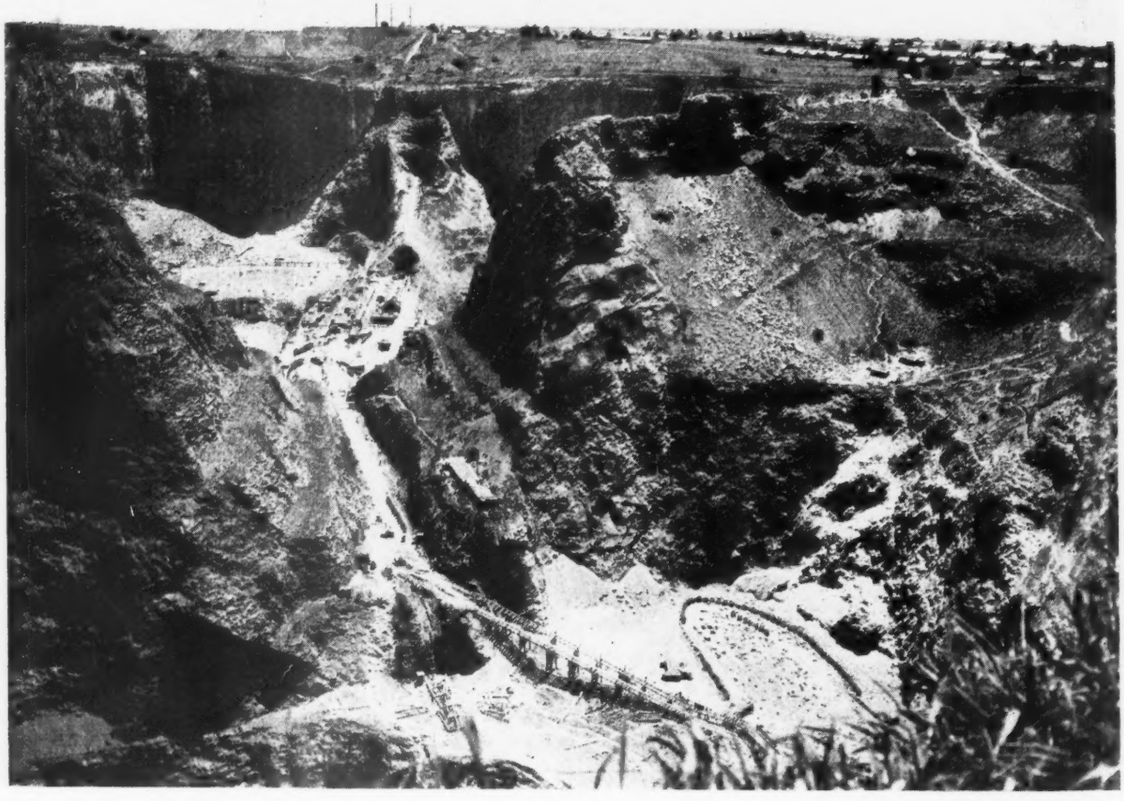
Chromium Demand Expanding

ANNOUNCEMENT by the Oakland Motor Car Co. that its new models are to utilize chromium plating for the radiator shell, lamp rims, and most of the other brightly finished metallic trimmings of the car, calls to mind again the increasing importance of this metal. Only recently have electroplating methods been developed that would assure smooth, adherent, and commercially useful coatings. Now that the electro-metallurgists have solved this problem, it devolves upon industry to utilize the metal to the best advantage.

Chromium is the hardest known metal—even harder than iridium and the hardest alloy steel—being rated at 9 on Moh's scale, or equivalent to emery. Also, even very thin films of the metal are remarkably resistant to abrasion, and it would not be surprising to see chromium platings developed for much mining and milling equipment that now depends only upon alloy steels and heat treatment to resist wear. Its coefficient of friction is very low. It is somewhat affected by hydrochloric and sulphuric acids, so chromium-plated articles may not find a place in leaching and electrolytic precipitating plants, but it is unaffected by hydrogen sulphide or sulphur dioxide. The cost of chromium plating will no doubt be reduced materially as commercial application of the product is developed. It now costs perhaps twice as much as nickel plating, which it is supplanting for many purposes. Non-rustible or so-called "stainless" steels, which contain around 12 to 14 per cent of chromium, and heat-resisting alloys containing about 20 to 25 per cent of chromium, are also requiring a constantly expanding tonnage of this metal. Stellite, too, is about one-third chromium to which it no doubt owes much of its hardness.

As to the supply of chromite, the ore of chromium, the United States is in much the same position as it is with regard to manganese. This country has plenty of low-grade material, but except under unusual conditions, as during the war, it produces nothing, though consuming well over half of the world's supply. Unlike manganese, there is no tariff on chromite, and it seems altogether unlikely that any reasonable tariff would do much toward stimulating the industry. Supplies in other countries, notably Rhodesia, are too extensive and of too high a grade. The Rhodesian deposits have received little publicity, but are thought to be enormous, so that no fear of a chromite famine can be imagined, even though the demand increases materially. Some idea of what this increase has been can be gained from the fact that just before the war the United States imported only about 65,000 long tons a year, which grew to about 150,000 tons in 1925, 215,000 in 1926, and in the first five months of 1927 has been at the rate of 265,000 tons a year. The Bethlehem Steel Co. gets a little from Cuba, India is responsible for a small production, and near Thetford Mines, in Quebec, are found rather extensive deposits; but these ores are not comparable to those of Rhodesia. New Caledonia, a former source, has been almost if not entirely supplanted. Methods of beneficiating the low-grade United States ores might be developed, as are those of manganese, but the incentive is not particularly strong. In view of the large supply of the higher-grade ore available, the increased demand of the last year or two has had practically no effect on the price, which has remained fairly constant for some years at $20 or slightly above, per ton, for ore containing 50 per cent chromic oxide.





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The Premier Diamond Mine

in the Pretoria District of the Transvaal, South Africa

Concreting the Morning Shaft

By J. Fred Johnson
Contractor and Consulting Mining Engineer, Eureka, Utah

J. Fred Johnson

THE Morning mine, owned by the Federal Mining & Smelting Co., a subsidiary of the American Smelting & Refining Co., is west of and adjacent to the town of Mullan, in the Cœur d'Alene mining district, Idaho. The mine is worked through adits, of which the principal one is approximately 10,000 ft. long. From this adit, two shafts serve the areas above and below the adit level. The shaft below the adit level, a rectangular four-compartment structure, was a prolific source of trouble, and the grief increased with depth. In preparing to sink this shaft, a station 40x80 ft. was cut to full size before being timbered, so, at that time, the shaft seemed to have been ideally located in solid formation. As a matter of fact, the rock has since broken up in blocky masses only after many years of exposure. This station and the first two hundred feet of shaft have given comparatively little trouble, although supported by ordinary timbering. Below the 200-ft. point the shaft support has been reinforced by jacket sets for 1,600 ft., and forty shaft men were employed on three shifts, relieving the blocking, which is cedar, to allow for crushing of the blocks before failure of shaft timbers, replacing timbers and guides, and moving skip-pocket chute lips when the timber became twisted so that chute lip and skip did not meet.

ON THE night shift the shaft was given over entirely to the repair crew, at which time entire sets were removed and replaced. For changing station sets the three shifts available on change days were used. Two special men employed continuously on the night shift did nothing but change guides. Pipe lines in the shaft were hung in such a manner as to allow for shifting of timbers without breaking or interfering with them or with the service.

In sinking from the 2,450 to the 2,650 level, retimbering or cutting of timbers was constantly necessary to allow for the passage of the sinking bucket and crosshead, and when the sinking was completed, four months were spent in retimbering before the skips could be used.

This account of the major difficulties will give some idea of the trouble, worry, and expense necessary in keeping the shaft open, and even after this close attention it was the usual thing for the cages to scrape wall plates in one or two places. These were the conditions as I found them on my initial visit to the Cœur d'Alenes on an observation tour in the summer of 1924. After a visit to the mine, I suggested to the management that concrete would remedy the unsatisfactory conditions in the shaft, basing my conclusions on observations upon the successful concreting of a 1,900-ft. shaft when I was general superintendent for the Chief Consolidated Mining Co. at Eureka, Utah. Frederick Burbidge, general manager, subsequently engaged me to put in a test section of 40 ft. of concrete support in the shaft sump below the 2,650 level. This was considered an extreme test, as a faulted area in this section had aggravated conditions at this point.

AS TWO pieces of concrete work in the mine—a concrete-lined room for the hoisting engine used for an auxiliary man and supply cage, and a concrete retaining wall for the ore bins, both at the collar of the shaft on the adit level—had failed, the general opinion prevalent about the mine was that concrete was unreliable and the proposed work was therefore not looked upon with favor. Investigation showed, however, that both of these pieces of work had been put in without regard to proper foundations, that the reinforcement consisted of greasy cables and rusty rails improperly placed, that the concrete was too lean in cement for the aggregates used and was improperly handled, and that the resulting structures were not properly reinforced concrete at all. Failure was inevitable. The old hoist room and the retaining wall were slowly moving into the shaft as failure proceeded below the collar of the shaft, and in replacing the retaining wall and bracing up the old engine room a 30-ft. reinforced concrete collar and a new retaining wall were poured in January, 1926, the reinforcement being built around 18-in. I-beams 25 ft. below the shaft collar as a foundation. This section shows no signs of failure. The structure of the shaft collar is illustrated in Fig. 1.

Chemical analyses of the quartzite in the shaft revealed the presence of clay in seams of varying width, and the conclusion was formed that the ground movement was the result of weathering and hydration of some of the rock constituents. During subsequent concreting operations, this action was observed to have penetrated at times to a depth of 6 ft. in a month, and during the same interval the walls had moved in 6 in. These bad conditions were further aggravated in that section of the shaft by the fault mentioned before. This fault was visible in the shaft for 140 ft., and the influence of it was noticeable for 200 ft. Even when cribbed tight the brecciated material on the fault would disintegrate and slough rapidly.

In preparation for concreting, the available aggregates were tested by screen analyses and test blocks were made to determine the best proportions. The water in the pump sump, collected from ditches, was found unfit for concrete and circulating water from the compressors was piped down the shaft and used for this purpose.

To combat the quick movement which with timber carried everything before it, it was decided to use a calcium chloride in the mix to assure quick setting of the concrete throughout the test section. This secured the

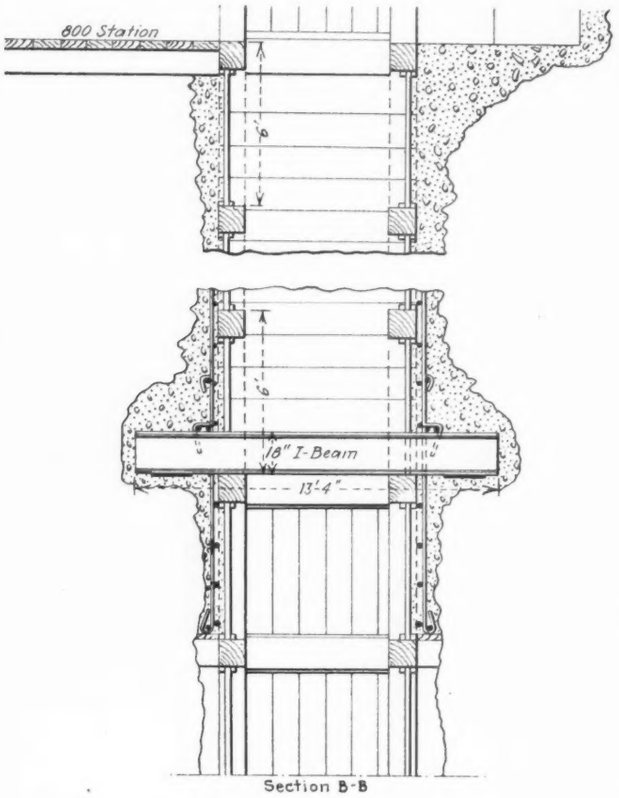


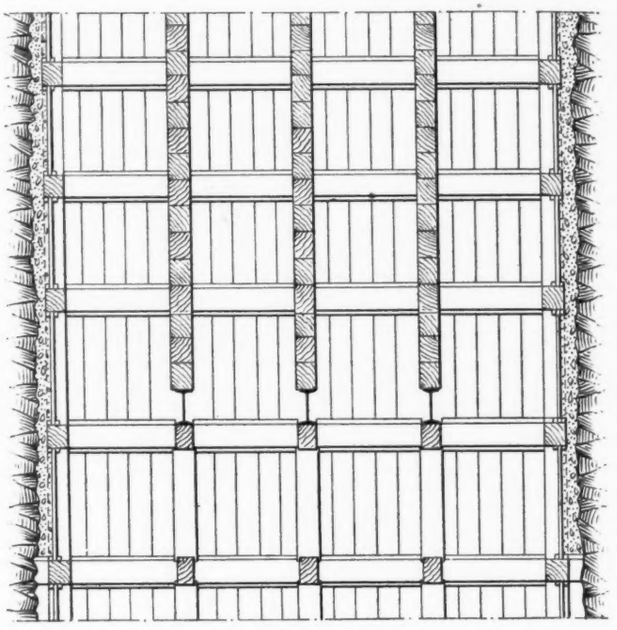
Fig. 1—Concrete shaft collar on adit level of Morning shaft

desired result better and cheaper than special quick-hardening cements, but heat was generated which made working conditions almost impossible in the confined space of the shaft. In subsequent work calcium chloride was omitted, as it was found that the chemical action in the walls ceased immediately on sealing them with concrete. An admixture of calcium hydrate was used to make the concrete more plastic, as both sand and gravel were crushed rock from the mills of the district and made a concrete which was rough and hard to work, especially in thin dividing walls.

REINFORCEMENT consisted of ⅝-in. square, mild steel bars, which for convenience and speed in placing in the shaft were tied in sections of a 30-in. vertical range. Bars were spaced 10 in. apart, the wall reinforcement consisting of two carrying bars and one tension bar and the dividing wall reinforcement consisting of six straight horizontal bars held by six rectangular hoops of ⅜-in. steel. All reinforcement was designed to interlock at the corners and at the splices opposite the dividing walls. Details of reinforcement are shown in Fig. 2.

The forms first used were of 2-in. material of 30-in. vertical height designed to collapse and be raised intact, the supposition being that they could be used six or eight times. In practice, however, it developed that they were very difficult to handle in the confined space available; they became heavy as a result of saturation with water, and they lost their shape in the abuse they received in stripping. Under the wet, mucky conditions prevailing in the shaft, repairing these forms was impracticable. Five-foot sections of light material were then used, these forms being broken in stripping, and about 75 per cent of the lumber being recovered and used over again. All material had to be loaded outside, transported two miles through the tunnel, and lowered 1,650 ft. through the shaft without delay to the regular mining operations.

The concrete cycle consisted in taking out a set of



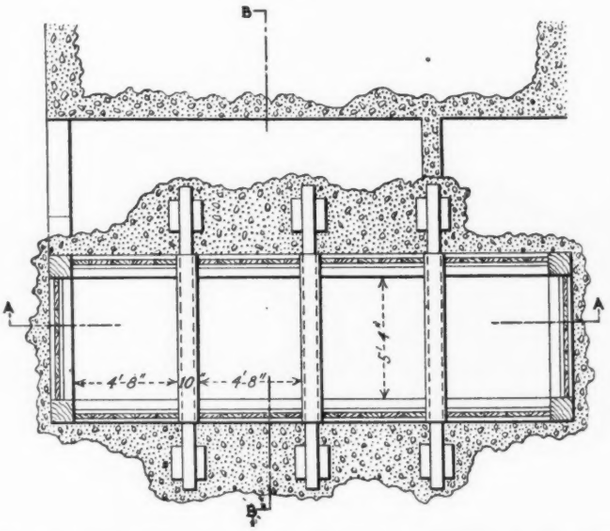
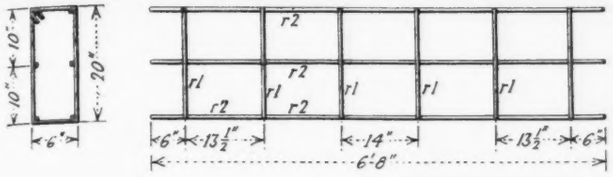


Fig. 1a.—Concrete shaft collar on adit level of Morning shaft. Note in Section A "cribbed" dividers and also inset lagging with concrete back filling

timber, ordinarily 5 ft. in vertical height; cleaning up the rubbish and rock that sloughed off; setting forms; placing reinforcement; building casting platform; pouring concrete; and protecting concrete for the next cycle.

After putting in the 40-ft. test section, the management decided to continue the concrete lining up to the 2,650 level, this being an additional 72 ft. In this



1 DIVIDING WALL SECTION						
Description	Mark	Pcs.	Size	Length	Cut from	Remarks
Stirrup	r1	6	¼" ϕ	4'-9"	¼ ϕ -20'	Bent as shown
Bar	r2	6	⅝" ϕ	6'-8"	⅝" ϕ -20'	Straight
1 WALL SECTION						
Stirrup	r3	3	⅜ ϕ *	3'-0"	⅜" ϕ -18"	Bent as shown
Bar	r4	2	⅝ ϕ	6'-8"	⅝" ϕ -20"	" " "
	r5	1	⅝ ϕ	6'-8"	⅝" ϕ -20"	" " "

* Afterward increased to ⅝"

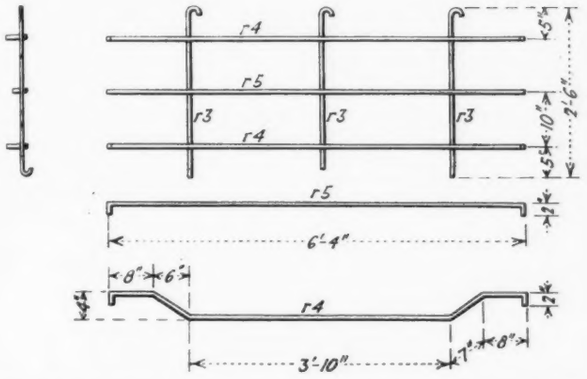


Fig. 2—Details of shaft reinforcement. Note in the section for dividing walls the number of vertical rods was increased from 6 to 10 and ⅝-in. rods used. The number of horizontal bars was increased to 8

portion of the shaft a 42-ft. section of back-filled timber sets was put in as a test of the theory that the sealing of the rock would stop the movement, this comparatively weak section being without reinforcement and relying solely on the checking of movement in the rock by sealing its exposed surface. The section was in a portion of the shaft not affected by the fault and was surmounted by a 10-ft. protective collar of reinforced construction. This section shows no signs of failure after two years.

Three months after the completion of the test section, there being no sign of checking in the concrete, it was decided by the management that concreting was the successful method of overcoming the trouble in the shaft, and it was decided to sink and concrete 400 ft. of the shaft for the development of two lower levels in the mine.

A plan was initiated embodying the idea of sinking and concreting as long lifts as possible and eliminating the delay and expense incidental to the changing from sinking to concreting and from concreting to sinking again. The concrete was watched carefully, as it was realized that blasting close to the concrete might affect it adversely. Nothing happened, however, until the shaft had been sunk 30 ft. and the bottom of the shaft was 40 ft. below the bottom of the concrete. Then all three of the dividing walls began to crack and give way, working from the bottom upward. When two more rounds had been shot, this cracking had traveled 10 ft. and the walls at the bottom of the concrete had come together three-quarters of an inch.

A 30-ft. section was then concreted and the broken dividing walls were repaired. The construction of this 30-ft. section was reinforced concrete of the same design as the test section, with the exception of an increase in the dividing-wall reinforcement. Heavy timber stulls were put in before the next sinking was resumed, as a further strengthening of the bottom section of concrete, this new section having had less than three weeks to set before sinking was resumed. Again nothing occurred until blasting took place 40 ft. below the bottom of the concrete, at which time the cracking started as before,

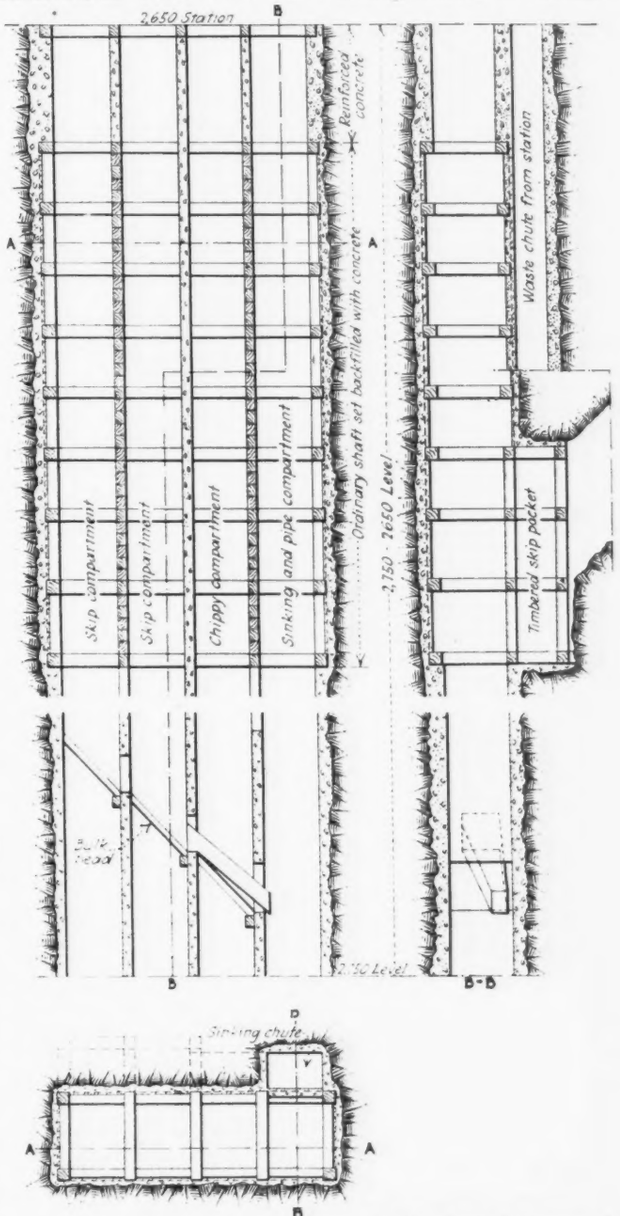


Fig. 3—General cross sections of the shaft between the 2,650 and 2,850 levels and the portion of the shaft concreted as a test section

but went up less rapidly, owing to the increase in reinforcement and the timber bracing.

Five sections of concrete were thus put in, greater care being taken each time to protect the bottom section of concrete. Longer lifts were sunk each time, except where the proximity of stations or skip pockets necessi-

tated the concreting of a shorter section. Finally, after the concreting of the fifth section, the shaft was sunk 143 ft. without dangerous impairment of the bottom divider walls, and sinking could have been continued indefinitely were it not for the fact that the company wanted a section of concrete put in to allow ore to be mined from the 2,850 level.

IN THE progress of the work, the dividing walls were found to be the weak point in the shaft lining. For this reason the center dividing wall was accordingly increased in thickness from 10 to 14 in. The number of horizontal rods in each 30-in. fabricated section was increased from six to eight. The stirrups were also increased in number from six to ten and they were made from ⅝-in. square bars instead of from ⅜-in. round bars. To further reinforce the walls at the bottom of the concrete section, solid, double, horizontal bulkheads constructed of 12x12-in. timbers were placed in all except the sinking compartment. These timbers were cut with a 1½-in. bevel on one end and were tightened in place by special hardwood wedges. Except for the sinking compartment, the shaft was filled with rock as close as practicable to the bottom of the concrete section. This last-mentioned precaution was probably the most important factor in enabling the sinking to be carried on indefinitely without serious damage to the concrete. A contributing and likely the all-deciding factor in the long sinking was the fact that the lowest section of concrete was then, for the first time, entirely away from the zone influenced by the fault.

Another additional precaution was the shortening of rounds, but as more rounds were required and the total amount of powder used was about the same, the advantage of this is doubtful. The dividing walls actually did start to fail when the bottom of the shaft was 40 ft. below the bottom of the concrete, but, owing to increased strength of construction and the bulkheading of the shaft, this failure had not reached a serious degree when the shaft was 100 ft. below the concrete. After the 100-ft. mark was reached, the sinking had no effect on the concrete above. In the final sinking, the concrete lining was more than 100 ft. away from the bottom to start with, but no difficulty was experienced.

AS THE limit of the hoist has been reached, and further sinking of the shaft is not contemplated, the last 200 ft., except for a 17-ft. section at the 3,050 station and 10 ft. above and below this station, which are reinforced, has been constructed of back-filled timber, as in the original test section. This construction, where further sinking is not contemplated, will seal off the rock, stop the chemical action, and serve as well as the more expensive reinforced concrete. This conclusion is upheld by the fact that one-half of the 2,850 station backfilled and sealed only with sand has stood intact for more than a year, whereas the other half of the same station required recribbing behind the timber in less than six months. Guniting has also served to check chemical action, but, as guniting was not applied until after disintegration penetrated for some feet, it was impossible to pick back to solid ground, and guniting was therefore only partly successful. Even at that, it was sufficiently efficacious to warrant reguniting after a period of about a year.

General observations from the concreting of this shaft and the Chief Consolidated shaft at Eureka, Utah, and from experience also, in other concrete shafts which were studied in conjunction with these two, result in the following conclusions, which do not, however, apply to shafts lightly concreted for fireproofing purposes or where timber prices are prohibitive:

Where concrete construction is used, aggregates require thorough testing and constant watching.

In the confined area of a shaft, the working of the concrete mass is difficult, so rich mixtures must be used. This is particularly necessary where corrosive action of waters, of frost, or chemical action is to be guarded against.

To hold heavy ground concrete shafts should be designed with thick, heavily reinforced dividing walls, and side walls should be made as thin as possible, with a minimum of 6 in., and heavily reinforced.

Where movement along faults causes trouble, concrete should not be used in place of the more elastic and more easily repaired timber construction.

To prevent chemical action, gunite can be used where the shaft is dry and where it can be applied before disintegration has penetrated beyond the point where ground can be picked. Where concrete is used, dividing walls should be reinforced heavily, but side walls can be made thin, with a minimum of 4 in. in thickness.

Back-filled timber construction can be used with cribbed dividing walls. This construction is not as permanent as concrete, but it is cheaper and has the advantage of requiring less skill, and its placement is thus within the capacity of ordinary miners.

One observation has never been satisfactorily explained. Why did the concrete, some of it three weeks old and some four months old, always fail first, during the blasting, when the bottom of the shaft was 40 ft. below the bottom of the concrete? I have consulted powder experts about wave lengths of concussions through air and rock, but have not found a satisfactory answer. This may have been a coincidence or a peculiarity of the Morning shaft. However, where the ground conditions permit, it is, in my opinion, a good practice to sink to a depth of 100 ft. below the finished lining before placing a new section of lining. This cannot always be done, and much shorter intervals may be necessary in some shafts.

To sum up the points for and against concrete shaft support, much can be found to favor the use of concrete except the all-important consideration of cost. Where fireproofing and permanence are desired, a cheaper construction can be used, but where the conditions are such that the best construction is necessary, the cost is great, and justification for the increase in cost over other methods of support must be found either in the earnings of the mine or in the savings made through a decrease in the cost of shaft maintenance.

Potash From Palestine

THE DEAD SEA is once more being considered as a possible source of potash. Although there is no technical difficulty in the production of potash salts from this source, according to a writer in *Chemistry and Industry* (London), transportation may be a problem, since the nearest station is Jerusalem, 30 miles away and 3,000 ft. above the level of the Dead Sea. The technical difficulties are of no great moment, and, notwithstanding the transport disadvantages, it should be possible to place potash on board ship at Jaffa for £4 a ton.

Improving Flotation Results at The Rising Star

By H. S. Gieser
Metallurgical Engineer, Los Angeles

REARRANGING the flow sheet of the flotation department of a concentrating plant very frequently will result in improved results without the addition of any equipment whatever. This is particularly true when several types of flotation machines are available, with capacity sufficient to permit of some "juggling" of the machines. An interesting case in point is that of the plant at the Rising Star mine, near Redding, Calif., where zinc is the principal metal recovered. The ore is complex, consisting of sphalerite, chalcopyrite, galena, and varying amounts of pyrite, the transition from sphalerite to pyrite frequently being abrupt. It occurs in high-grade lenses in a wide shear zone and has been worked intermittently for many years. The sphalerite is very finely disseminated, so that fine grinding is necessary to liberate it.

The ore is treated in a 200-ton flotation plant rather poorly designed. Some of the machinery is modern and some is a heritage of previous operations. According to the present method of treatment, the ore is crushed dry to pass ¾ in. in a mill formerly used for sampling, and is conveyed to fine-ore bins. Thence it is conveyed to two 6x4½-ft. Marcy ball mills in series, each in a closed circuit with a Dorr duplex classifier and a cone. The ore is then ground until about 85 per cent will pass 200 mesh.

Flotation equipment at the present time consists of:

One 16-Cell Minerals Separation, 24 in., Sub A machine
One 22-Cell M.S. as above
Six 6-ft. Fagergren machines, Horizontal Rotor type
One smaller Fagergren as above
One 43-in. by 9-ft. Forrester machine, pneumatic type

The sixteen-cell M.S. machine formerly was used for separating copper-lead and zinc, but owing to the difficulty encountered in depressing the zinc and to a high final zinc tailing, bulk float was found to be more profitable. The plant is equipped with quite a number of centrifugal pumps and Dorr thickeners, and changes in flow sheet were numerous. There are two Oliver filters, the damp concentrate from which drops into bins or standard-gage cars as necessary.

THE ore is ground in a lime circuit, and the alkalinity maintained so that about 10 c.c. of a 1/40 normal sulphuric acid solution is required to neutralize a 25 c.c. sample of the circulating solution. This is maintained by making titrations at half-hourly intervals. At times when the per cent of pyrite in the feed is increasing, the alkalinity may be doubled to keep the iron out of the concentrate. Pine oil is the frother used, xanthate the collector, and water-gas tar and Barrett No. 634 assist in cleaning the tailing.

Reagent consumption was somewhat as follows:

Reagent	Pounds Per Ton	Reagent	Pounds Per Ton
Lime	4.23	Water-gas tar	0.045
Xanthate	0.24	Barrett 634	0.02
Pine oil	0.01		

During June of 1926 the twenty-two-cell M.S. machine was used as a rougher. A rough concentrate was taken off a variable number of cells, usually eight or ten. A middling was taken off the remaining cells up to the nineteenth and returned to the head of the machine, and the froth from the last four cells was returned to the eighteenth cell for re-treatment. The rough concentrate from the M.S. machine was cleaned in two Fagergren machines and recleaned in two others. The tailing from the Fagergren machines joined the rougher circuit. Results obtained over a seven-day period were as follows:

	Zinc Per Cent	Iron Per Cent	Zinc Recovery Per Cent
Heads	21.2	8.1	....
Concentrate	52.0	5.4	....
Tailing	1.8	...	....
Recovery	....	...	94.8

The ore was high in grade and the percentage of iron was low, so the concentrate was rich. The price of zinc was fair and operations were profitable.

AS THE year wore on the high-grade ore became exhausted, and as a result of a change in the ore and the employment of inexperienced operators, the recovery in the mill was not nearly so good. In a typical period during ten days in September the results were as follows:

	Zinc Per Cent	Iron Per Cent	Zinc Recovery Per Cent
Heads	15.5	10.4	....
Concentrate	47.1	7.4	....
Tailing	3.03	....	....
Recovery	....	....	86.1

In the meantime the price of zinc had fallen, so a change was imperative or operations would cease. The management considered several schemes, and, as the addition of more machinery was out of the question, was advised to change the circuit, using the Fagergren machines as roughers and the M.S. machines as cleaners. Accordingly, four Fagergren machines in series were cut in as roughers. The rough concentrate was sent to the ninth cell of the twenty-two-cell M.S. machine and a primary concentrate taken off the following ten cells, the froth from the last four cells being returned to the eighteenth cell as before. Primary concentrate was pumped to the head of the M.S. machine and a clean concentrate taken from the first eight cells. Tailing from the clean concentrate went on through the machine and the final M.S. tailing joined the head of the rougher circuit. This Fagergren rougher circuit was steadier and therefore easier to operate. Results using four Fagergren machines as roughers during seven days in November were as follows:

	Zinc Per Cent	Iron Per Cent	Zinc Recovery Per Cent
Heads	17.5	10.7	....
Concentrate	46.9	8.7	....
Tailing	2.44	....	....
Recovery	....	....	90.8

Accordingly a fifth Fagergren machine was added to the series, and an effort made to raise the grade of the concentrate by crowding the iron out of the froth by means of a heavy circulating load. The froth from the fifth Fagergren was pumped to the fourth, the froth from the fourth was pumped to the third, and the froth from the third was pumped to the second. Fagergren machines 1 and 2, only, made a rough concentrate, which was pumped to the fifth cell of the sixteen-cell machine. On this machine cells seven to sixteen inclusive made a primary concentrate, which went to the first cell. Also, this machine was equipped so that the first six cells made a clean concentrate, which went to the concentrate thickener. Tailing from the first six cells went on through the machine. It was found very difficult to drop the iron out of the concentrate once it had been floated. The

zinc went out the tailrace in preference to the iron, leaving the concentrate.

The circuit accordingly was changed back and the twenty-two-cell M.S. used as a cleaner as before. The following results are typical of a seven-day period during January, 1927, using the twenty-two-cell M.S. as a cleaner and five Fagergrens as roughers:

	Zinc Per Cent	Iron Per Cent	Zinc Recovery Per Cent
Heads	15.4	10.6	....
Concentrate	46.6	9.0	....
Tailing	1.53	...	...
Recovery		...	93.2

Some time before a Forrester flotation machine—one of the pneumatic type—had been built and tried as a cleaner. Probably because of the oils used, results were unsatisfactory. It was then tried as a rougher ahead of the Fagergren machines, where it was plainly evident from the character of the froth and the assays that the oil combination was wrong. It was deemed unwise to change flotation conditions more than necessary, so the Forrester machine was changed to the end of the Fagergren circuit and the tailing was immediately lowered.

Results during a typical seven-day period in April were:

	Zinc Per Cent	Iron Per Cent	Zinc Recovery Per Cent
Heads	20.7	12.3	....
Concentrate	48.4	7.3	....
Tailing	1.28	...	....
Recovery	...	...	96.4

The Forrester flotation machine, as used by the California Zinc Co., consists of a box or large launder 9 ft. long 43 in. wide and 36 in. high. It is flat-bottomed and level. There are two longitudinal baffles on each side which make a 10-in. quiet space for each froth-overflow lip. Agitation is furnished by air at 1- or 2-lb. pressure from a blower. Air pipes of ½-in. diameter are provided, at 3-in. centers, which project downward to within 4 in. of the bottom.

It was found necessary to cut the amount of oils used, or over-oiling would result. The froth from the fifth Fagergren machine when operating well was scant, with large black bubbles, whereas from the Forrester it was pale and wet, with small bubbles. When conditions were correct in the Fagergren machines the Forrester cells increased the recovery only about 2 per cent; but when conditions were bad the improvement was a great deal more. On a different series of samples from the foregoing the Forrester machine increased the recovery of the zinc 2½ per cent, but of the copper, which was present as chalcopyrite, 8 per cent additional.

The main point is that on an ore difficult to clean up the addition of a flotation machine of a different type frequently helps. Quite a little of the improvement in results is to be credited to a better mechanical condition of the mill, which made for a better operating condition, as there was less lost time. Also, an increasingly greater skill of the operators was a factor. No account is taken of a changing tonnage treated during the period.

A twenty-two-cell M.S. machine seems to provide an excessive amount of cleaner area on 150- to 200-ton daily feed. But because of the reagents used on a high-iron feed, excessive amounts of pyrite were floated which had to be dropped in the cleaner. So the cleaner machine had to be carefully watched. When the cleaner tailing carried about 25 per cent zinc, the clean concentrate was satisfactory and there was not enough circulating load to affect the final zinc tailing.

Potash Brines of Great Salt Lake Desert Studied

THE potash-bearing brines of the Great Salt Lake Desert, in Utah, were utilized as a source of potash during the World War and have since been the subject of much interest because of their relatively simple character and their resemblance to artificial brines of the Stassfurt region, in Germany, and because solar evaporation may be employed in recovering potash and magnesium salts from them. Recently the U. S. Department of the Interior announced the publication of the results of an investigation of these brines, made by the Geological Survey in co-operation with the General Land Office and the Bureau of Mines. The work was conducted and the report prepared by T. B. Nolan.

The investigation included the boring of 405 shallow test holes and the making of many chemical tests and analyses. It shows that the shallow brines near the surface are not as abundant as has been supposed and that any large-scale commercial utilization of them would also necessitate consideration of deeper brines, the nature and abundance of which can be ascertained only by further and deeper prospecting. Moreover, the composition of the shallow brines is found to vary with the nature of the rocks exposed in the regions adjacent to the places from which the samples were taken. The modifying influence of buried hills or mountains within the desert region, the exact location of which must be determined by drilling, will therefore have to be considered in the study or attempted utilization of the deeper brines. The report includes a map showing the test holes.

The Seven Ages of a Mine

A Pseudomorph After "The Seven Ages of Man," in "As You Like It"; Act 2, Scene 7.

All the world's a stage,
And all the mining properties are players;
They have their exits and their entrances;
And one mine in its time plays many parts,
Its acts being seven ages. At first the outcrop,
Bringing rich visions to the claimant's eyes.
Then the hopeful prospect, with a lone man;
Its stubborn, rockbound tunnel creeping like snail,
Unwillingly to ore. And then the company,
Sighing for money, with a long prospectus
Made to its ore-vein's value. Then a bonanza,
With rich new strikes, the leader in a boom,
Boastful of profits, oft in rise and fall of stock,
Seeking the bubble, big mill tonnage,
E'en by sending waste with ore. And then the noted mine,
In well kept treasury with good surplus lined,
With ore blocked out, and cost an idol grim,
Full of old stopes and modern drifts-on-vein,
And so it plays its part. The sixth age shifts
Into the lean and hopeless leasing time,
With shoots worked out and vein pinched thin,
Its youthful mill, well saved, a world too big
For its shrunk stopes, and its big ore stream proud,
Changed now into the leasers' dribble, thumps
And rattles down the hungry bins. Last scene of all,
That ends this strange eventful history,
Is bleak abandonment, and mere oblivion,
Sans ore, sans hoist, sans mill, sans everything.

F. J. GIRARD.

Scandinavia's Iron-Ore Reserve 4,600,000,000 Tons

By Olin R. Kuhn
Donner Steel Co., Buffalo, N. Y.

ONE-TENTH of the iron-ore resources of Europe lie in the north, in Sweden, Norway, and Finland. From these countries comes about 15 per cent of Europe's iron-ore production, and within their borders are some of the largest known deposits of magnetite ore. In them the iron industry has not been greatly developed. In fact, this northern iron industry is practically confined to Sweden. About 90 per cent of all of the iron ore mined in the Scandinavian countries is exported to Germany, England, Belgium, the United States, and elsewhere.

Sweden is by far the largest producer of iron ore, its production being from 5,000,000 to 10,000,000 tons annually, of which 3,500,000 to 8,500,000 tons is exported. The country produces from 500,000 to 800,000 tons of pig iron per year. Norway mines from 300,000 to 700,000 tons of iron ore each year, all of which is exported. Finland has practically no production of importance as yet. Practically no coking coals are found in Scandinavia and most of the iron is made with charcoal as fuel. Nevertheless, these countries have abundant water power and the general trend of the iron industry in the future will probably be toward electric smelting.

Table I.—Scandinavian Iron Ore Production
In Short Tons

Year	Sweden	Norway	Finland
1891	971,000	.....	.....
1895	1,874,000	.....	.....
1901	2,750,000	.....	.....
1905	4,295,000	.....	.....
1909	3,823,000	40,000	.....
1910	5,461,000	101,000	.....
1911	6,052,000	217,000	.....
1912	6,592,000	402,000	.....
1913	7,355,000	536,000	5,200
1914	6,481,000	642,000	.....
1915	6,773,000	703,000	.....
1916	6,874,000	411,000	.....
1917	6,117,000	298,000	.....
1918	6,517,000	94,000	3,000
1919	4,901,000	88,000	.....
1920	4,446,000	78,000	.....
1921	6,356,000	54,000	12,700
1922	6,098,000	264,000	1,200
1923	5,500,000	380,000	1,000
1924	6,391,000	523,000	.....

Sweden is the mainstay of the Scandinavian iron-ore industry and has been famous for centuries as a producer of iron ores. It was the most important center of the iron-ore production of the world during the later Middle Ages and has always been a source of supply of high-grade ores for Germany, England, and Belgium. Sweden owes its pre-eminence in this industry to its ample supply of fuel, which it has in its vast coniferous woods, to the ready means of transportation afforded by its numerous lakes and rivers, and to the abundance of easily accessible deposits of iron ore.

As already stated, Sweden contains some of the largest known deposits of high-grade magnetite ore. The phosphorus content of these ores varies considerably. The basic process brought large deposits of phosphoric ore into economic prominence and laid the foundation of the present position of Sweden as an important exporter of iron ores. It is obvious that it would be a waste of natural advantages to smelt the phosphoric ores with charcoal as long as the purer ores are available, and as

Sketch map of Scandinavia

Sweden has no coal fields of any importance, practically the whole of the Swedish phosphoric ores are mined for export. Germany has always been the largest customer

Table II.—Production and Exports of Swedish Iron Ores
In Short Tons

	1910	1913	1916	1920
Production of iron ore	5,460,791	7,355,428	6,874,018	4,446,483
Exports to				
Germany	3,223,945	4,897,401	4,229,501	2,558,710
England	574,819	662,023	832,622	613,673
Belgium	139,304	227,924	.....	250,051
United States	266,311	355,410	213,745	95,223
Others	178,288	1,212,670	1,598,150	929,826
Total exports	4,342,667	6,336,254	5,447,659	3,668,699
Domestic consumption	1,118,124	1,019,174	1,426,359	777,784
Pig iron production	594,233	718,472	720,958	462,988

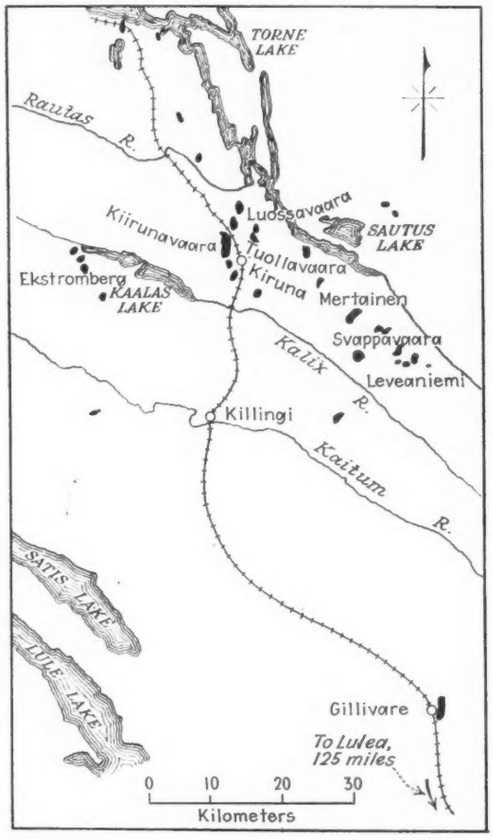
for Swedish ores, followed by England, Belgium, and the United States. Table II shows the distribution of Swedish ores in 1910, 1913, 1916, and 1920. In 1925

Sweden exported 8,800,000 tons of iron ore, half of which came from the Kiiruna deposits.

The iron-ore deposits of Sweden lie in three geographic regions—namely, Swedish Lapland or northern Sweden, central Sweden, and southern Sweden.

Northern Sweden Has Largest Reserve

The iron ores of Swedish Lapland form the largest reserve of magnetite ore in Europe, and probably in the world. They are found in igneous rocks and in metamorphic rocks of igneous origin. The ores occur in lenticular masses, in dike-like forms, and in bands that alternate with bands of apatite rocks from which



Sketch showing the situation of the iron-ore deposits of northern Sweden

they can easily be separated. The ores of this region are high-grade magnetites averaging more than 60 per cent in iron, although they are generally high in phosphorus also, carrying up to 4 per cent.

The province of Norrbotton, in northern Sweden, contains the largest deposits—namely those of Kiirunavaara, Gellivaara, Svappavaara, Leveaniemi, Mertainen, and Ekstromsberg—and the smaller deposits of Tuollavaara, Laukkeijarva, Altavaara, and Painirova. These deposits are for the most part magnetite with a small portion of specular hematite. A variable percentage of apatite is present, but the percentage of silica and silicates is small.

Most of the larger iron-ore deposits in Sweden are owned or controlled by the Trajikakiebolaget Grangesberg-Oxelosund company. This company exports almost 90 per cent of all of the ore shipped from Sweden and operates a fleet of twenty-four seagoing boats.

Kiiruna ore field, comprising the deposits of Kiirunavaara and Luossavaara, is by far the largest and most important iron-ore field yet discovered in Sweden. The deposits lie about 100 miles southeast of the port of Narvik in Norway and extend in almost a continuous line for 5 miles.

The deposit is a mountainous range rising above Lake Luossajarri and extending 3 miles in length with a width of from 100 to 500 ft. and a dip of 55 deg. At the highest point of the deposit it is 780 ft. above the lake level and it is known to extend to at least 2,000 ft. below the level. According to careful magnetic measurements, this orebody should extend to a depth of about 7,500 ft., although it has not been proved at this depth. The deposit is operated by the Grangesberg company and produces more than half of the iron ore mined in Sweden. Until recently it was considered to contain a reserve of about 750,000,000 tons, but in the last ten years a deep boring more than 2,000 ft. below the lake level has shown that the orebody widens at greater depth and that the percentage of high-grade ore at these depths is greater than at the surface. New estimates of the reserves of ore in the Kiirunavaara deposit, given by the Friends of Mining of Sweden in 1924, put the tonnage at 1,500,000,000 tons of available ore.

The ore is magnetite and varies from 58 to 70 per cent in iron and from 0.015 to 4 per cent in phosphorus. Kiirunavaara ores are generally classified into five grades, and although some of the ore is of bessemer grade, the greater part is of basic or high-phosphorus grade. The ore is now mined in open cuts along the side of the mountain and is crushed in giant crushers to a commercial size. This crushed ore is shipped to Narvik for exporting.

Table III.—Iron Ores from the Kiirunavaara Deposit

	Class "A," Per Cent	Class "C," Per Cent	Class "D," Per Cent	Class "F," Per Cent
Iron	69.50	67.69	61.80	58.68
Phosphorus	0.019	0.258	2.058	2.76
Sulphur	0.02	0.017	0.05	0.058
Silica	1.69	2.07	1.94	1.90
Alumina	0.32	0.61	0.38	0.40
Lime	0.23	0.88	6.75	8.41
Magnesia	0.45	0.46	0.15	0.34
Titanicacid	0.08	0.18	0.18	0.12
Moisture	0.38	0.82	0.43	0.59

THE Luossavaara deposit, which is also controlled by the Grangesberg company, lies slightly north of the Kiirunavaara orebody and is a continuation of this field. This deposit extends for about a mile in length and from 80 to 200 ft. in width, and has an average dip of about 65 deg. Estimates of the reserve of ore in the deposit vary from 22,500,000 to 100,000,000 tons, but if the ore at great depth is considered available, the latter figure is probably more nearly correct. The ores are similar to those in the Kiirunavaara deposit.

South of the Kiirunavaara deposit lies the Gellivaara field. It was first opened in 1857 by English and Swedish capital. This venture was not very successful, and in 1904 the deposits were taken over by the Grangesberg company, which operates them today. The district covers an area about 4 miles long by a quarter of a mile wide and contains a number of deposits up to half a mile in length. The ore is similar in composition to that of the Kiirunavaara field, but is somewhat different in structure, being coarse grained. As in the Kiiruna field, the ores of the Gellivaara district are graded according to the phosphorus content. The ore dips 30 to 70 deg. and has been worked to a depth of more than 650 ft. Most of the ore in this district is mined underground by shrinkage stoping, but slicing is also used. Only about 7 per cent

is taken out in open pits. The ore is known to extend to a depth of 1,500 ft. and it is estimated that there is a reserve available here of 180,000,000 to 240,000,000 tons. Three ore-dressing plants handle the product, making 1 ton of concentrates from 1½ tons of ore mined.

The Koskulle-Kulle deposit lies on the east side of the Gellivaara Malmberg Mountain and is estimated to contain a reserve of about 40,000,000 tons of high-grade magnesite ore averaging more than 69 per cent iron. This deposit is said to be owned by Austrian capital. An analysis of the ore is as follows: Iron, 69.37 per cent; silica, 2.29; phosphorus, 0.1-0.4; alumina, 1.08; and lime, 0.61. Ores from the Gellivaara and Koskulle-Kulle deposits are exported from Lulea, on the Gulf of Bothnia.

DEPOSITS of iron ore are found on Svappavaara Mountain at Svappavaara, Leveaniemi, Mertainen, Ekstromsberg, Tuolluvaara, and Painirova. These are a mixture of fine-grained magnetite and specular hematite ores varying in analysis in different parts of the field. Amphibole occurs occasionally in the magnetite and garnet in the hematite. Most of the deposits are owned by the state, and the ore carries from 43 to 66 per cent of iron and is high in phosphorus. The deposits lie east and southeast of the Kiiruna field and the ore is shipped from Narvik.

The Svappavaara deposit is estimated to contain about 28,000,000 tons of available ore and the Leveaniemi deposit about 38,000,000 tons. Ekstromsberg field contains a reserve of 48,500,000 tons of ore averaging more than 60 per cent iron and 1 per cent phosphorus. At Mertainen the deposits have not been fully explored, but appear to be extensive, and the Imperial Mineral Resources Bureau of London estimates that they contain at least 5,000,000 tons of ore averaging 64 per cent in iron and low in phosphorus. The Painirova deposit is similar to those at Mertainen, although little is known as to the size of the reserve. The Tuolluvaara field lies about 3 miles east of the Kiirunavaara field and is estimated to contain about 6,850,000 tons of high-grade ore similar to the rest of the northern Sweden ores.

Total reserves of the Svappavaara deposits can be put at about 116,350,000 tons of high-grade ore. Roesler puts this tonnage at 125,800,000 tons of known and probable ore and more than 100,000,000 tons of possible ore.

Table IV.—Analysis of Svappavaara Mountain Ores

	Magnetites, Per Cent	Hematites, Per Cent
Iron	43.20 to 65.80	48.12 to 64.26
Phosphorus	0.608 to 3.188	0.358 to 3.088
Sulphur	0.027 to 0.081	0.050 to 0.060
Lime	1.10 to 11.60	0.63 to 6.59
Titanic acid	0.15 to 0.40	0.09 to 0.45

The Ruoutevare deposit is of a type different from the rest of the northern Sweden ores, being definitely a magmatic segregation from basic eruptive rocks. It lies in an inaccessible part of the country on the eastern side of the mountain range that separates Sweden from Norway, and appears to be about 1 mile long and 750 ft. wide, but only a half of this area is estimated to contain ore. The orebody is a relatively thin flat sheet containing 40 to 50 per cent of iron and 10 to 12 per cent titanic acid. This should yield on concentration a product carrying 65 per cent iron and 5 per cent titanic acid. The ore is essentially magnetite and ilmenite, and it is estimated that there is about 12,000,000 tons of ore, equivalent to about 7,000,000 tons of concentrates.

Estimates of the iron-ore reserve of northern Sweden have been steadily increasing, as a result of more recent and more complete surveys. To date the iron-ore deposits in northern Sweden have shipped more than 85,000,000 tons of ore.

Table V.—Iron-Ore Reserves of Northern Sweden

District and Deposit	Reserve, Tons	Per Cent Iron
Kiiruna		
Kiirunavaara	1,500,000,000	65.00
Luossavaara	100,000,000	65.00
Gellivaara		
Gellivaara	240,000,000	64.00
Koskulle-Kulle	40,000,000	69.00
Svappavaara		
Svappavaara	28,000,000	43–65
Leveaniemi	38,000,000	.....
Ekstromsberg	48,500,000	61–65
Mertainen	5,000,000	64.00
Tuolluvaara	6,850,000	.....
Ruoutevare	12,000,000	.....
Total	2,018,350,000	

The Deposits of Central Sweden

The iron ores of central Sweden occur as lenses and stocks of magnetite in schists and gneisses. The orebodies vary in thickness from 16 to 33 ft. and in two places, Grangesberg and Strassa, they are 295 and 360 ft. thick. At Norberg the orebody is continuous for a length of 3,900 ft. and at Grangesberg for 3,250 ft. The most important mining areas in central Sweden, with the ores that are found in them, are as shown in the following tabulation:

Lomberg: Hematite and magnetite ore carrying 50 to 60 per cent iron and 0.10 per cent phosphorus.
Ormberg: Same as Lomberg, but perhaps a little richer in iron and carries more hematite than magnetite.
Grangesberg: Mainly magnetite with some specular hematite and variable proportions of phosphorus, averaging 1 per cent.
Strandberg: A small deposit high in phosphorus.
Persberg: Magnetite, relatively low in phosphorus.
Norberg: Magnetite, very low in phosphorus.
Dannemora: Magnetite, exceptionally low in phosphorus.

The Grangesberg deposits, controlled by the Grangesberg company, are the largest bodies of iron ore in central Sweden and have been known since the Middle Ages. This ore field is about 2½ miles long by 1,200 ft. wide and has been an active producer since 1885. The ore is a mixture of magnetite and specular hematite. It occurs in lenticular bodies, dipping at about 70 deg. in fine-grained gneiss, and contains about 61 per cent iron and 1 per cent phosphorus. The deposits were first worked by open-cut methods, but now practically all of the mining is done underground by slicing. Two principal veins are worked here at a depth of 450 and 550 ft. and the reserve is estimated at 150,000,000 tons.

Present output of the Grangesberg mines is about 1,400,000 tons of crude ore annually, which yields about 1,000,000 tons of concentrates. Grangesberg ores are shipped to the port of Oxelosund, 164 miles distant, for exporting. The ore in the largest deposits contains much phosphorus, and about one-third of the ore is concentrating ore, whereas the remainder is estimated to be direct-smelting ore.

Dannemora Ore Low in Phosphorus

Probably the most famous deposits of the Bergslag district are the Dannemora fields, consisting of various deposits of ore lying in an area of limestone. This ore is magnetite and is celebrated for its exceptionally low phosphorus content, ranging from 0.002 to 0.005 per cent. The deepest workings in this district are the Ormberg mines, which have reached a depth of 1,570 ft.

Other groups of deposits in central Sweden are found at Persberg, Norberg, and Lomberg, but in most cases the deposits are small and widely scattered. The reserve of the Dannemora and other deposits in central Sweden, not including those in the Grangesberg area, can be put at about 85,000,000 tons.

Table V.—Iron-Ore Reserves of Central Sweden

	Short Tons
Grangesberg	150,000,000
Dannemora, etc.	85,000,000
Total	235,000,000

DEPOSITS OF SOUTHERN SWEDEN

At Taberg, in Smaland, in southern Sweden, there is a well-known deposit of titaniferous magnetite ore. On account of the grade of ore it has not been worked for many years. The ore carries 20 to 30 per cent iron, 4 to 6 per cent titanic acid, and phosphorus 0.1 per cent or less. This ore is unusual in that it contains a small percentage of vanadium, and if an economic method of concentration is found it could be made suitable for commercial use. The deposit occurs in the form of a mountainous knob rising about 300 ft. above the surrounding country. It is estimated to contain a reserve of about 50,000,000 tons.

Table VI.—Iron-Ore Reserves of Sweden

Section	Reserve, Short Tons
Northern Sweden	2,018,350,000
Central Sweden	235,000,000
Southern Sweden	50,000,000
Total	2,303,350,000

Table VII.—Various Estimates of Sweden's Iron-Ore Reserves

Estimated by	Year	Actual Reserve, Short Tons	Possible Reserve, Short Tons
Tornebohm	1905	1,000,000,000	.....
International Congress	1910	1,525,000,000	1,723,000,000
J. L. W. Birkinbine	1916	1,335,300,000	.....
W. Lindgren	1918	1,272,000,000	1,125,000,000
F. H. Hatch	1920	1,119,000,000	.....
Max Roesler	1921	1,342,000,000	1,243,000,000
Iron Trade Review	1920	1,469,000,000	.....
Imperial Mineral Resources Bureau	1922	1,119,000,000	178,000,000
Miscellaneous	1926	2,303,350,000	625,000,000

Reserves of iron ore in Sweden are among the largest in Europe and are a source of supply for the countries that do not have enough high-grade domestic ore to fill their requirements. The country's resources can be placed at about 2,250,000,000 tons or more and the potential or possible reserve is well over half a billion tons.

Russia Builds New Dredges

WRITING in the *Gorniy Journal* (*Mining Journal*, Leningrad), Kryloff, a Russian mining engineer, gives it as his opinion that the dredges at present in use in Russia and Siberia are not sufficiently large and that existing units should be scrapped in favor of dredges of 13½ to 15 cu.ft. capacity. He therefore welcomes the first efforts of the Ural Platinum Trust to install four 13½-cu.ft. dredges; these are partly of American, partly of Russian, construction. The installation of these Ural dredges, he feels, will encourage operators in Siberia and the Far East to follow the example set. Kryloff considers that the substitution of large new dredges for old and worn-out small ones would be a most powerful factor in the revival of the Russian gold industry. The cost of dredges, even when built partly in Russia, is high, but an adequate supply of large units is considered to be one of the real stepping stones to the restoration of the gold reserve in that country.

Mr. Tuthill Talks on Zinc

Secretary of American Zinc Institute Shows Dependence of Modern Housekeeping on This Metal

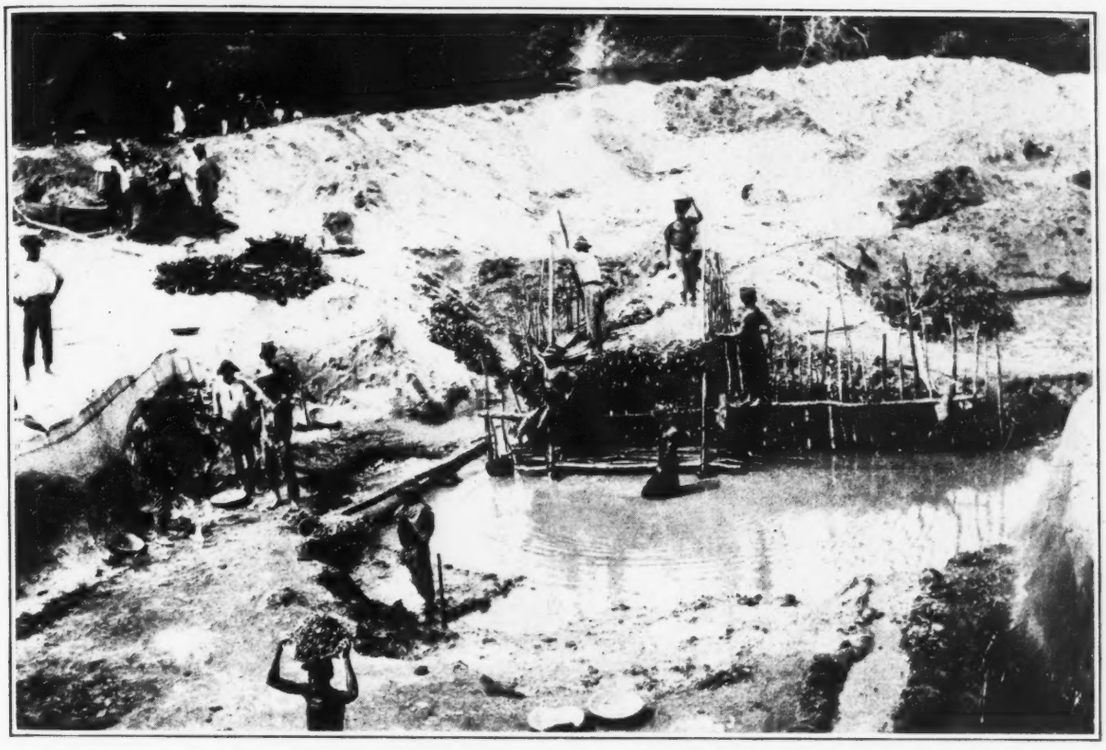
"MAY I illustrate how intimately zinc in its several forms is associated with our life from the cradle to the grave—pardon me, to be strictly modern, from the bassinette to the mausoleum?" said S. S. Tuthill, secretary of the American Zinc Institute, before the St. Louis Chamber of Commerce recently. The new-born babe is dusted with a zinc-base powder, and that baby's rubber toys will contain zinc. Its convalescing mother, before receiving the congratulations of her friends, will use her vanity case, probably made of zinc, and surely containing cosmetics based on the products of zinc. The lacquer on her bed will contain zinc, as will the metal if the bed is made of brass. The like is equally true in respect to the lighting fixtures and to the brass ornaments in the house. The paint on the walls of the room contains zinc, as do the shades at the windows. Zinc was also an essential factor in the dyeing of the hangings used in decorating the room and even of the clothes in the wardrobe.

"The linoleum or oilcloth in the kitchen contains zinc, and the hot-water tank is coated with zinc to prevent rusting. There are many zinc parts in the washing machine in the laundry, and the pipes of the hot-air furnace in the cellar are protected from rust by zinc coating. The containers of the dry batteries that give life to the bell service in the house and to the radio are made of zinc. The reading matter in the home is printed with a zinc-content ink, and the illustrations in that reading matter were etched by the photo-engraving process upon zinc sheets or plates.

"The house may be painted with a zinc-base paint. It may be roofed, guttered, and down-spouted with rolled zinc, the least expensive permanent material for such purpose, because of its practical indestructibility. The garage may be a zinc-coated, or galvanized, steel structure. Such a building is comparatively inexpensive and practically fireproof. The automobile in the garage contains 4 per cent of zinc in metallic form, and zinc oxide is probably the compound used to increase the strength and toughness of the rubber tires with which it is equipped.

"Zinc was absolutely necessary not only in the manufacture of war munitions but also in their shipment across the seas. Whenever you hear the tones of a pipe organ, remember that 75 per cent of its metal is zinc, used in this and other musical instruments because of its non-vibrant quality. The smoke screens of naval vessels and airplanes are the product of zinc dust. A zinc paste was used as a protection against the mustard gas of the enemy. Extensive, indeed, is the use of zinc in modern medicine. The linings of the caskets in which were brought home the boys who made the supreme sacrifice were all made of zinc.

"Scientists tell us that zinc is to be found in the sun and in animal, plant, and sea-born life, and that it is necessary to the proper functioning of the human body. And when our bodies cease to function, we should, paraphrasing William Cullent Bryant, 'wrap the draperies of our couch about us and lie down to pleasant dreams,' forever undisturbed because sealed in a casket made of that everlasting metal, zinc."



Bailing seepage water from pit of Garcia Leal's mine

Mining Black Diamonds in Brazil in the Piranhas District

By Arthur S. Bandler
New York

THE Piranhas black diamond district of Brazil is about 250 miles west of the city of Bahia, Brazil. To reach it from Bahia you take a steamer across the bay and up to the Paraguassu River to the town of Cachoiera, where you remain overnight. This trip consumes about six hours. In the morning you are ferried across the river in *ajujes,* the large canoes made out of the trunk of trees, to the town of San Felix, the railroad terminus, where you take a government train, which is operated by a French company. After a ride of about twelve hours, you arrive at Itaete. From now on, your trip is made by mule trail, and after a long day's ride you reach the Piranhas district.

Among the pests encountered on this journey, the only annoying one was the *corrapatos* (wood tick) that you brushed off the tree branches. Ammonia, iodine and other remedies will make them back out, but my companion preferred to touch them with a lighted cigarette.

You are now about 1,000 ft. above sea level. The district is more or less level, with low hills scattered about, and is covered by a dense growth of brush and larger trees. Until you reach one of the small mining towns, you see only an occasional negro shack in the bush.

The Piranhas region, called by the native diamond washers *"piao de bateia"* (bottom of the pan), is being continually enriched by carbon and white diamonds that are washed down from the mountains.

Carbon (black diamonds) and white diamonds were discovered in the district in 1876 by a miner named Lima. The work done in the territory was performed by slaves. At that time carbon (black diamonds) had no value and were thrown away. Since the discovery, the mining work done has been of the most primitive type and continues to be so today. Only a small area has been mined, but even as it is the total production has been large.

The black diamonds are found in the old river bed. The miners try to find a place where the bedrock is high and the values concentrated, so as to have less trouble with seepage water. To locate the old river bed they look for the *jatoba* and *goncalo alves* trees, which thrive on top of it. They then remove the overburden, which consists of clay, mud, and sand about 15 ft. deep. This they remove by filling their *carumbe,* a small wooden bowl about 1½ ft. in diameter, placing it on their heads and dumping it some distance away; after the removal is completed, they have reached the *cascalho* or diamond-bearing gravel, which ranges in thickness from 1 to 6 ft. They remove the gravel in the same way, and when water starts to seep in they try to bail it out, using 5-gal. wooden tubs, which are passed from hand to hand up to a drainage ditch. The gravel is piled up near the river.

At the gravel pile (both men and women are engaged in this work) the largest stones are picked out by hand, and the remainder is taken to the river, where expert washers await it. They have erected a tripod over the water, from which a screen is suspended by a rope, which allows the screen to sink a little way into the water. After loading it they move the screen, which has a fine mesh, forward and backward until they have screened out all the sand. The gravel remaining in this screen is then placed in another screen which has a large mesh. Under this they put a batea, a large wooden concave bowl, submerged in the water. This screen is then agitated, the finer material falling into the batea. The coarser material which remains on the screen is placed on a sorting table, where it is looked over for

Screening and washing diamond-bearing gravel

carbons and diamonds. Material remaining in the batea is then successively screened through smaller mesh screens, the larger stones being sorted by hand in each case. The remaining product, which has passed through the last screen, is too fine in size to be successfully sorted by hand. This is concentrated in a batea which rests on the water, and by whirling in a very adept manner, the gravel is concentrated. Since the carbon and diamonds are of a higher specific gravity, they are found in the concentrates at the bottom of the cone-shaped batea.

The sizes of carbon range from $\frac{1}{16}$ karat (about the size of a small pinhead) up to several hundred karats each; however, a carbon was found in Bahia that weighed 3,078 karats, and at present market price it would have been worth over $300,000. This stone was broken into sizes adaptable for diamond drilling, and did great service on the Mesabi range. Sizes above 10 karats are rarely used for diamond drilling, so the larger carbons are broken into smaller sizes by pressure. A carbon was found in Bahia this year weighing 660 karats. I have bought and broken in Bahia within the last three years several carbon weighing from one to 300 karats and one weighing 458 karats.

Carbon buyers travel in the interior by day over lonely mule trails, through jungles, brush, and woods, fording streams and frequently arriving at their destination at night, and are known by many of the natives to carry with them valuable quantities of carbon and diamonds, as well as money. But I have never heard of a single case of robbery or loss through theft. The black diamond districts are governed by native chiefs and stealing or robbery is considered an unpardonable crime and is treated as such, in marked contrast to conditions in more sophisticated communities.

Almost Six Billion in Industrial Group Life Insurance

THE GROWTH of industrial group life insurance in the United States, which had its beginning only fifteen years ago, has been so rapid that today the lives of about 4,700,000 employees are protected under this form of insurance for a total amount of approximately $5,500,000,000, according to a study just completed by the National Industrial Conference Board. The number of those insured under the group plan increased by more than 1,500,000 during the last two years alone.

The social significance of this development in American industry, the Conference Board points out, is evident in the light of investigations which led up to the adoption of the group insurance plan. It was found that more than 40 per cent of all wage earners carried no life insurance of any kind; that most of those carrying insurance were insufficiently protected, their policies averaging less than $500 each; that many employees could not obtain life insurance at all or only at, to them, prohibitive rates because of occupational hazard or advanced age; that about one-fifth of all employees were debarred from carrying standard life insurance because of physical disability. Before the inception of group insurance, about 35 per cent of all employees at their death left their families with no provision for the future and in serious financial straits.

Group insurance, supplying blanket coverage at low rates and without the requirement of medical examination, has been steadily remedying this situation during the last fifteen years. The average amount of coverage per worker insured under the group plan is $1,200, as against the $500 average among the comparatively few carrying standard life insurance. In larger plants, the average amount of protection under group insurance is found to be considerably greater, running as high as $2,000 and more per employee in establishments with 25,000 workers or more; in the smaller plants, employing from 200 or less up to 3,000, insurance ranging between $1,000 and $1,200 is the rule.

The average annual premium for group insurance is estimated by the board at from $10.50 to $12 for each $1,000 of group life and total disability insurance, making the total premium cost of the $5,500,000,000 to be borne between $55,000,000 and $65,000,000 annually, the larger part of which is paid by the employers. Though the trend is toward the adoption of "contributory" plans, under which the employees pay part of the premium, nearly half of the total amount of group life insurance now in effect is still of the non-contributory type, the employers carrying the entire cost. In addition, the employers carry at least 25 per cent of the cost of insurance under the contributory plans. The non-contributory plan prevails in the smaller establishments, while the large plants incline more toward the contributory type of group insurance.

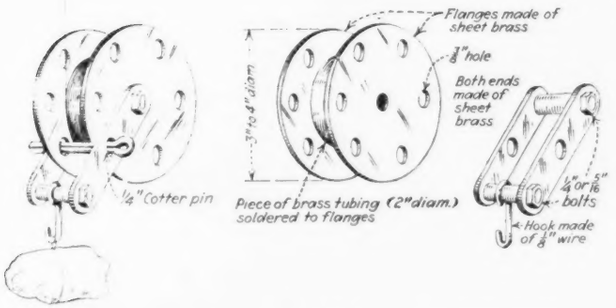
A great majority of the employers, however, the Conference Board finds, feel compensated in that group insurance, according to their experience, eliminates worry and hence makes for greater contentment and higher efficiency among the workers; that it tends to reduce labor turnover, and that by creating good will among employees it is an important factor in offsetting the inevitable loss of personal contact between employees and management in the large-scale establishments of our age. In many cases, the board finds, group insurance plans have been successfully combined with mutual benefit associations and pension plans.

USEFUL OPERATING IDEAS

Handy Reel for Steel Wire

By Charles Labbe

WHEN IT IS NECESSARY to use a wire for lining up machinery in the mill or for underground work, fine steel wire is not always easily handled on a spool, nor is it convenient to maintain it taut and properly coiled for close work. A simple reel, such as that shown in the accompanying illustration, can be made from a spool or drum (light sheet brass being the handiest material) mounted on a frame made of two pieces of tubing, brass strips, two machine bolts, and an iron hook upon which to hang a weight. Near the outer circle of the drum a number of holes about ⅜ in. in diameter are drilled clear through both flanges and also through the two sides of the frame. A ¼-in. cotter pin can be inserted through frame and drum to hold the drum in a fixed position, thus keeping the wire at the length set and

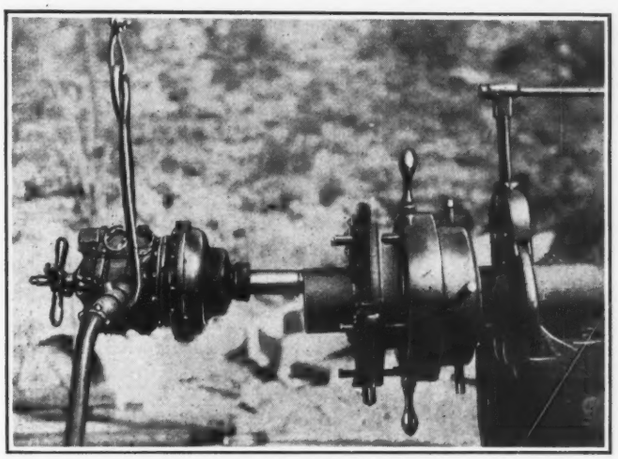

Flanges made of sheet brass
⅜" hole
Both ends made of sheet brass
3"to 4" diam
¼" Cotter pin
Piece of brass tubing (2" diam.) soldered to flanges
¼" or ⅛" bolts
Hook made of ⅜" wire

A convenient light reel for handling steel wire

under the tension caused by the weight. The reel can be made of any size to meet the needs of the situation, as, for example, one sufficiently large to hold a few hundred feet of large wire ($\frac{1}{32}$ in.) or small enough to hold 50 to 100 ft. of the finest steel wire for close work on machinery.

Threading Pipe

THREADING PIPE by hand is a laborious method, but is frequently necessary in erection work. When compressed air is available (and this is the condition at most small or large plants) an ingenious combination of air motor and pipe threader as shown in the accompanying illustration can be worked out and is effective in speeding up the work and reducing the labor required for the job. At the Magma mine, Superior, Ariz., where the combination shown is in use, a heavy bench supports the pipe vise. An *A* frame to which the air motor is suspended by a small wire rope with drum and ratchet enables the air motor to be conveniently handled and swung into position for attachment to the pipe threader. The air motor can be used for many purposes in and about an erection job as well as in the repair shops.



Equipment used at Magma mine for threading pipe by compressed air

Reinforced Concrete Shaft Lining

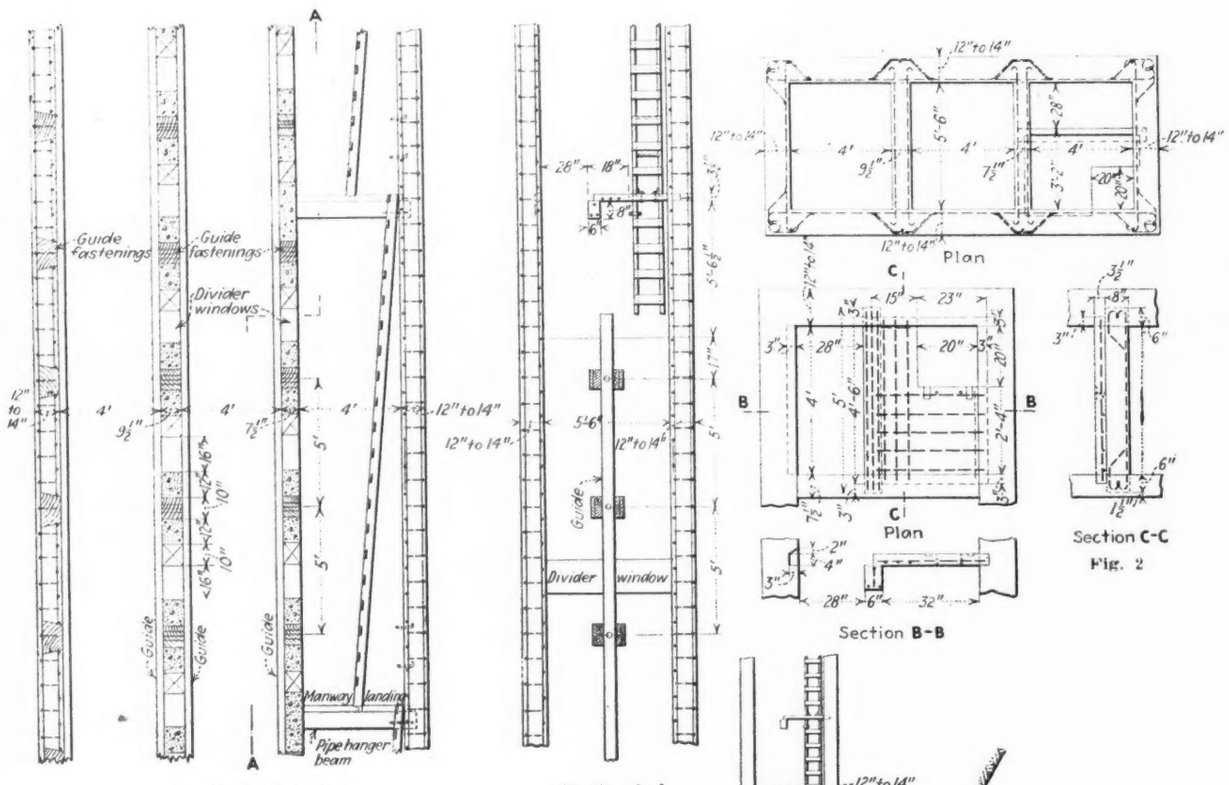
By E. E. Slack

AT THE MAGMA MINE of the Magma Copper Co., Superior, Ariz., concrete lining is being placed in No. 3 shaft. The shaft has three compartments, two hoisting and one ladder and pipe compartment. The dimensions are all the same, 4 ft. by 5 ft. 6 in. in the clear. The plan for reinforcement and the longitudinal and transverse sections are shown on the next page.

Wall thickness varies from 12 to 14 in., and the principal reinforcement is at vertical intervals of one foot, with supplementary reinforcement midway between. Shaft walls are designed as if they were built up by a succession of beams, the reinforcing bars being close to the inner wall surface as shown in the plan. The four outer walls are continuous, but "windows" are left at intervals in the divider slabs below the old timber dividers which were left in place. The divider walls are 9½ in. thick between the hoisting compartments and 7½ in. in thickness between the hoisting compartment and the ladderway. A reinforced concrete pipe-hanger beam, 6 by 8 in. in section, divides the ladderway compartment and supports the landings at intervals of 20 ft. A pipe compartment 28 in. in width by 4 ft. is thus formed. The ladder opening in the 38 by 48-in. platform is 20 by 20 in. in the corner of the shaft. Ladder's heels are set back 21 in. from the shaft wall, giving a slope of about one

Fig. 1 shows a longitudinal section of the No. 3 shaft, the plan being shown in the upper right-hand corner. Fig. 2, just below, shows plans for a concrete manway landing and pipe-hanger beam, which is shown in detail by the Section C-C. Fig. 3 is the station plan, and Fig. 4, in the lower right-hand corner, is a plan and section of the concrete lining for an ore pocket in the No. 3 shaft.

Fig. 1



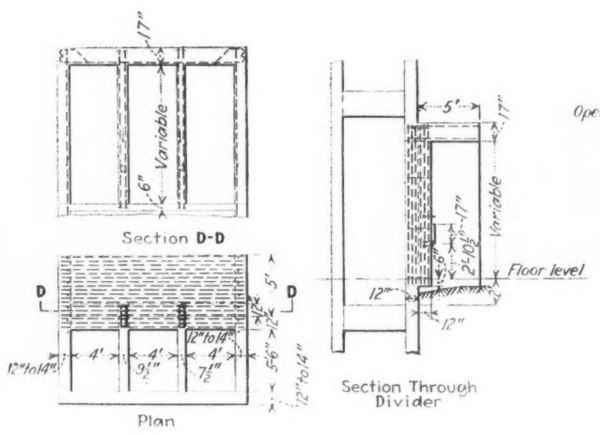


Fig. 3

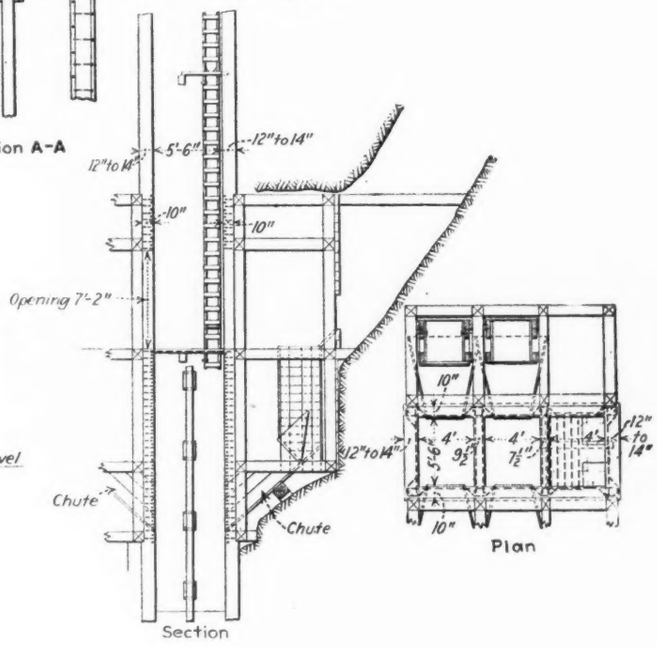


Fig. 4

inch per foot. Ladders terminate at the platforms and two iron handholds are placed in the concrete at 18-in. intervals above the platform and in the shaft walls.

Wooden blocks, 10 by 9½ by 16 in. and 10 by 7½ by 16 in., are imbedded in the divider walls for fastening the guides. The wooden blocks in the end wall are of truncated wedge form as shown in Fig. 1, so as to prevent displacement.

The steel reinforcement used is shown in the plan at the right of Fig. 1. All the steel is $\frac{5}{8}$ in. round with the exception of the tie rods which are $\frac{3}{8}$ in. in diameter.

A design for a concrete ladderway landing used at a station is shown in Fig. 2. The reinforcing bars in the 5-ft. section, at the left, are $\frac{5}{8}$ in. round; the others, $\frac{3}{8}$ in. The design for shaft ore pocket is shown in Fig. 4, both $\frac{3}{8}$ and $\frac{5}{8}$-in. round reinforcing bars being used. The steel reinforcement bars are indicated at the sides of the shaft and above the chute lip.

DISCUSSION

The Color of the Rio Tinto

THE EDITOR:

Sir—In his chronicles of the "Geologists in Spain" (*E. & M. J.*, July 2), T. A. Rickard records the interest and wonder aroused by that "chemical extravaganza," the changes of color of the Tinto River. Reversing their itinerary, the observer on leaving the Rio Tinto mines remarks the apple-green color of the water, which persists for a few miles and then, about 20 miles downstream, the green changes with surprising abruptness to the characteristic dark wine color that lends its name to the Rio Tinto, which, descending thence to the sea, stains its banks with deposits of iron oxide. The point in the river where the reaction takes place is not fixed, but wanders up stream and down according, it is said, to the season, whether wet or dry. Elsewhere[1] I have touched upon this striking phenomenon, but an explanation may be of sufficient general interest to bear some expansion here.

The waste liquors issuing from the leaching plant are charged essentially with ferrous sulphate, as the ferric salt has been reduced chiefly by passage through the pyrite dams and the remainder by the scrap iron of the cementation launders. In a shallow rapid stream the opportunity is at hand for quick aëration of the solution and oxidation of the salt to ferric sulphate, which is now ready for precipitation by any appropriate reagent. As the part of the watershed in question is igneous and but slightly subject to weathering, the supply of alkalies and lime is insignificant and the precipitation of ferric hydrates is best explained by hydrolysis, thus:

$$Fe_2(SO_4)_3 + 6H_2O = Fe_2(OH)_6 + 3H_2SO_4$$

It is, to be sure, asserted by some investigators[2] that a basic sulphate is always an intermediate stage in the natural production of hydrated ferric oxide, but Wagner[3] denies this, pointing out that ferric hydrate absorbs free acid to the extent of simulating basic sulphate. Be that as it may, the equilibrium of the reaction can be expressed:

$$\frac{C_{Fe_2(SO_4)_3} \times C_{H_2O}}{C_{H_2SO_4}} = k,$$

from which it follows that an increase in the concentration of water corresponds to a decrease in the concentration of ferric sulphate through its hydrolysis to ferric hydrate until equilibrium is restored. R. Blanchard and P. F. Boswell[4] find that in the proportion $1Fe_2O_3:4SO_3$ hydrolysis takes place when the dilution reaches 98.8 per cent water. It is, therefore, to be expected that when the relatively highly concentrated ferric solution of the Tinto has become sufficiently diluted by accessions of fresh water from its tributaries, hydrated iron oxide will separate out as a colloidal suspension, changing the color from a clear green to a deep red and finally precipitating as an iron ore mineral wherever it is concentrated by evaporation.

This notion also accounts for the upstream migration of the critical point during the season of high water when the requisite degree of dilution is reached earlier in the flow than in the dry season.

Here, then, under the open sky, are presented certain of the processes active in the vadose zone of massive pyritic orebodies, and it might possibly be fruitful to extend these speculations to cover the genesis of the once enormous lacustrine deposits of iron ore of which the Mesa de los Pinos and other iron capped buttes in the vicinity are the only vestiges left by erosion.

London, England. H. H. KNOX.

[1] "An Effect of Climatic Change on the Superficial Alteration of Ore Deposits." *Economic Geology*, Vol. XVII, Dec., 1922.
[2] W. Lindgren: "Mineral Deposits." 1913.
[3] W. D. Bancroft. "Applied Colloid Chemistry." 1921.
[4] Economic Geology. Nov., 1925.

* * * *

A Colorado View on Copper Curtailment

THE EDITOR:

Sir—In the financial columns of the morning paper I note the following item, dated New York, in regard to the copper market: "Indication is that price will work slowly higher. It is believed that producers have finally made up their minds not to produce more copper than they can sell at a fair price."

I almost got a laugh out of that. The item, with hardly a change in the wording, has appeared so often during the past three or four years that it is getting to be a joke. It is no longer taken seriously be anyone, and it is hard to see why the papers continue to give space to it. Certainly, the predictions contained in it have not been fulfilled, and there is no present indication that they will be fulfilled in the near future.

The statistics for June show that though the refinery output of copper was less than it was in May, the smelter output per day had actually increased. The small decrease in the world's stock of refined metal is encouraging, but it has happened so often before for a given month or two that it does not necessarily mean anything.

There is just one way to restrict the production of copper, and that is to dig less of it out of the ground; it cannot be done simply by talking about it. The price that consumers will pay for the metal will go up only when it can be shown that the supply is less than the demand. Buyers refuse longer to be stampeded by mere rumors of curtailment.

It is quite true that the principal copper-producing companies are not turning out as much copper as they are capable of doing. Many of them, no doubt, could increase their production quite materially; the point is that they have maintained a high average rate of output in the face of heavy stocks and falling prices. The

frequent references to the fact that the world's stock of refined copper is equivalent to only about thirty days' consumption are little more than foolish. As well say that there is only a three days' supply of milk in the city of New York. In the case of a commodity coming from a large number of different localities, and of which the production is continuous and free from interruptions, it is not economical to carry large stocks. The whole trend of modern business is in the direction of smaller inventories. All of the talk about the stocks of copper being "dangerously low," or of the possibility of a "runaway market," has been a waste of language. Certainly it has not fooled the consumers.

Roger W. Babson says that the larger copper companies are engaged in a game of freeze-out, with the object of eliminating the little fellows. If that is true, the man who bit off his nose to spite his face was a piker in comparison. It might sound more reasonable to say that the American companies are mining their copper as fast as possible, in order to make it easier for the African companies when they come into big production a few years hence.

Recent figures show that the consumption of copper in the United States is falling off, whereas that of Europe is slowly increasing. The experts have been so uniformly wrong in their guesses about the European market, and there have been so many false starts in the last few years, that only those with the gift of second sight could hope to predict accurately as to the future of the demand for copper.

In the meantime the only sane course for the copper companies to follow is that adopted by almost every other industry—namely, to limit production in accordance with demand. In coal and cotton and oil this is difficult, because of the tremendous number of producers. In the case of copper, with the vast bulk of the world's production in the control of two dozen corporations, it certainly seems to me as if it could be done.

Golden, Colo. IRVING A. PALMER.

* * * *

Precedence in Mining Schools

THE EDITOR:

Sir—I am interested in the historical references regarding mining schools contained in your editorial on the Colorado School of Mines in the issue of July 9 and in Mr. Donald R. Baker's letter, in your issue of July 30, referring to that editorial and discussing the founding of the Missouri School of Mines.

I would like to call to your attention the fact that the Massachusetts Institute of Technology established one of the earliest courses in mining engineering in America. In 1859 Prof. William Barton Rogers prepared a "Memorial" referring to the establishment of a "comprehensive Polytechnic College." This memorial was presented to the Legislature of the Commonwealth of Massachusetts by a committee in 1860. The General Court of Massachusetts passed an act on April 10, 1861, incorporating the Massachusetts Institute of Technology. The meeting to organize the Institute was held on April 8, 1862, but the Civil War prevented the initiation of actual instruction work at that time. A preliminary session was opened on Feb. 20, 1865, having an enrollment of fifteen students. The regular courses of instruction began Oct. 2, 1865.

During the early years of the Institute there were four courses of instruction, leading to degrees in civil engineering, mechanical engineering, mining engineering and metallurgy, and in science and literature. The first class was graduated in 1868. There had been a total of sixty-seven members associated with this class, but owing to the conditions brought about by the war a relatively small proportion, only eighteen, were graduated. Nine of these were graduated in the course of mining engineering and metallurgy. Included in this group of mining graduates of the Class of 1868 was Robert H. Richards, who has made such great achievements both in the professional and educational phases of mining engineering and who still is professor emeritus of the Massachusetts Institute of Technology. W. B. D. MOTTER, JR.

New York.

* * * *

"Depressing" Lead Prices

THE EDITOR:

Sir—The issue of the *E. & M. J.* for July 23 is just at hand. The first editorial discusses the low price for lead and I quote the following:

> "If the price of lead goes much lower it is going to be a mighty serious matter for our lead mines. Most of the large ones have curtailed and very few will be able to make both ends meet with lead selling at 6½c."

The above from an "anonymous" author presents but one side, one view of the situation; he might well have gone farther and stated the whole effect—namely, that it is going to be a *mighty serious matter for the welfare of the public and seriously affect the industries of the country.*

Pre-war prices were predicated on the handling of a higher grade of ore and a comparatively sufficient supply. The war, and later the unprecedented demands for lead in automobile and cable industries, put a heavy strain on lead production, with the consequent rise in price for the metal, due to the necessity of mining and treating lower-grade ores in order to meet the demand. The mines m ' the situation, and developed and equipped to supply the metal on the changed basis of operations predicated on the treatment of lower-grade ores. If the "market" is determined to return to a pre-war basis of prices, then there is but one recourse for the producers of the metals: to return to the pre-war basis of selective mining of high-grade lead ore and restricted output.

To one who has followed the discovery and development of lead-ore deposits and who knows that the world's supply has by no means kept pace with the rapidly increasing demand for the metal, the effort to suppress the price of lead, or to return it to a pre-war basis, means a calamity to the people of the country and disruption of industries rather than any serious or extended inconvenience to the miners. A half-truth, such as uttered in the quotation, is more damning to the industry than a misstatement of the fact, in that in the end it affects the public rather than the miners. The efforts of the "leading interests" to "prevent a runaway market" in lead are conceived in their own interest at a steady price, profitable to them, but one that will not be conducive to development of further resources in lead production and conceived without regard to the general welfare. Let the anonymous prophet worry not over the miner, but, rather, have consideration for industry and the ultimate consumer. A LEAD MINE OPERATOR.

The Effect of Coca

THE EDITOR:

Sir—In your issue of July 16 the article by Dwight E. Woodbridge on "Rejuvenating a Bolivian Placer" was read by me with considerable interest. The final paragraph on page 90 concerning coca seems startling and leads me to wonder if it is based on personal observation. I have spent in all about five years in the higher Andes of Peru and have taken a great deal of interest in coca and its effect on the natives, and because of these observations I cannot agree with several of the statements that Mr. Woodbridge makes.

There is no doubt as to the stimulating effect of this drug, but from my observation it is a habit-forming drug of the worst type, and when its use begins both physical and mental development are retarded, if not entirely arrested. The statement that it has a food value as well as being a stimulant is decidedly questionable, and I have never known a "gringo" who has used it regularly except those who had sunk to the level of "beach combers." So far as I have been able to judge, there is no reaction at all unless the leaf is chewed with lime, and it apparently takes several days from the time its use is begun until any reaction is felt.

Several of the medical staff of the Cerro de Pasco Copper Corporation have made quite a close study of this drug and its effect on the natives, and I hope some one will call this to the attention of either Dr. Prosser or Dr. Crane, and request a statement from a medical man's standpoint. Both of these gentlemen are qualified to speak authoritatively. F. W. COLLINS.

San Francisco.

* * * *

The Magnetite Deposits of Madera County, California

THE EDITOR:

Sir—The title given to my article in the May 7 issue of the *E. & M. J.* is unfortunate, as I am not willing to state that the Iron Mountain deposits in California constitute important reserves. I would say they are promising and merit exploration, but their importance is not yet proved. On page 765, in the sentence, "The typical metamorphics are closely joined . . .", the last word should be "jointed" not "joined." On page 767, second line, "Fig. 5" should read "Fig. 4," and on the same page, second paragraph, the statement "The orebody passes into the granitic rocks on both sides of its horizontal extension . . . " the word should be "ends," not "sides." The photomicrographs used in Figs. 5 and 6 are transposed.

The last sentence of the third paragraph on page 768 does not convey the meaning of my own sentence, which read, "I have not sufficient chemical and microscopic evidence to base an opinion on, as to whether replaceability and chemical interactions, apparently important in localizing many magnetite deposits of the western Cordillera of North America, in or near limestone, were also leading factors in localizing the Iron Mountain magnetite concentrations." Any one reading your sentence must wonder why I should consider limestone in the Iron Mountain deposits when it is not even mentioned as a rock of the area. What is meant, of course, is the replaceability and chemical interactions with the rocks described as the host of the magnetite.

On page 769 the heading "Economic Outlook Will Depend on Power Costs," is misleading. Power cost is an unimportant factor in the blast-furnace process, compared to the cost of the assembled raw materials. The use of the Iron Mountain ore by no means depends solely on the electric furnace process. Two sentences in my manuscript were omitted, which expressed the economic situation. These were: "The establishment of these blast furnaces is justifiable whenever a molten pig iron feed, produced under conditions in which the cost of transporting coking coal or coke is the outstanding obstacle, becomes more economical than the present cold pig iron and cold scrap feeds, in a section of the United States where scrap iron and steel are relatively cheap." . . . "In spite of the fundamental adverse factor of transporting coking coal or coke long distances, production of pig iron for direct steel furnace feed, from Californian iron ore, in the Los Angeles and San Francisco metropolitan areas, can be compared favorably, on the basis of cost per ton of melted pig iron in the steel furnace, with present pig iron now being used for this purpose." ELLSWORTH Y. DOUGHERTY.

Bucans, via Millertown Junction, Newfoundland.

* * * *

Cut-Hole Drilling Method

THE EDITOR:

Sir—I read with much interest the article in the July 16 issue of the *Engineering and Mining Journal* by Messrs. F. L. Ballew and W. H. Boyle describing the standard drill round at Newmarket, Tenn. While I was in charge of the Tully mine, at Stambaugh, Mich., for the McKinney Steel Co., I used the same round of holes except in the cut or burn holes. I used five holes arranged from above to below as follows: *X*, 1, *X*, 2, *X*, instead of three, 1, *X*, *X*.

We charged and fired holes 1 and 2 with 60 per cent gelatin and put three or four sticks of 40 per cent gelatin in the *X* holes. We fired all holes with fuse, letting holes 1 and 2 go first and the *X* holes last, if the 1 and 2 holes did not explode them (which they sometimes did). We drilled the holes only 4½ ft. deep, because the iron ore was so hard that it wore down the drill gage so fast that the hole at 5 ft. would be too small to hold enough powder to burn through. If we drilled deeper holes it would take too much time to bulldoze the holes to bring them up to gage. With this way of burning out the cut holes we made very satisfactory progress, whereas with any other round of holes it was almost impossible to make any progress.

I think that this style of cut-hole drilling was first used by a Cornish miner in the Champion (Michigan) iron mine (hard iron ore). His name was William White, and the cut was named the "Billy White cut."

Iron Mountain, Mich. CAPT. S. J. GOODNEY.

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Square-Setting in the Butte District

THE EDITOR:

Sir—In my article on "Square-Setting in the Butte District," in the July 30 issue, the captions on Figs. 7 and 9 are interchanged. That on Fig. 7 should be "Construction of temporary slides to facilitate handling of broken ore" and that on Fig. 9 "Details and construction of chute mouths." Also, Mr. Berrien's initials should be C. L. instead of C. W. CLARENCE M. HARRER.

NEWS OF THE WEEK

Summary

DECREASING amount of research work at U. S. Bureau of Mines experiment stations brings forth expressions of concern from mining interests. Present appropriations do not permit the Bureau to attack major research problems.

* * *

After several years of inactivity, the Ophir district of Utah is the center of much attention. Present exploration is attempting to develop the faulted areas below the surface deposits mined in the past.

* * *

Chihuahua Chamber of Mines issues an appeal to the mining and business organizations of Mexico, urging that a united effort be made to save the mining industry of the country.

* * *

Anaconda Copper Mining Co. is erecting the first unit of a two-unit plant for the treatment of molten slag from the East Helena smelter; operation of the plant is to begin Oct. 1.

* * *

Considerable activity is reported in the Sudbury lead-zinc district of Ontario, Canada; development work for future large scale operations is in progress.

* * *

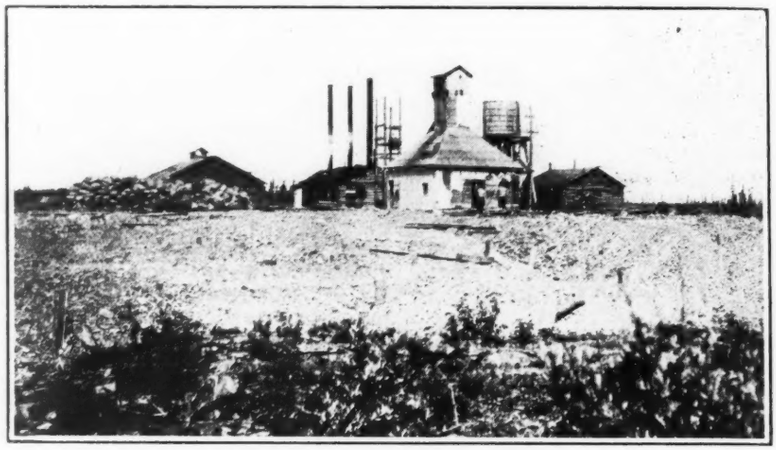
Unit of Noranda smelter, in the Rouyn district of Quebec, is being rushed to completion for the production of blister copper in October.

* * *

Representatives of the United States Co. announce a $1,000,000 consolidation of Colorado and Utah vanadium interests.

* * *

A cave-in occurring in the Waco field of the Joplin-Miami district drops mill and mine surface buildings thirty feet.



Shaft and power house of the Kitchener mine

Indications Point to Manitoba as an Important Mining Area

Former Mineral Production Restricted to Non-Metallics—Discovery of Rich Metal Deposits Brings Realization of Possible Wealth of Province

By E. G. Wilson
Special Correspondent

THERE are positive indications that the province of Manitoba, Canada, will assume the rôle of an important mineral area before many years have passed. Until quite recently its mineral production was restricted to structural materials and clay products, consisting principally of building stone, gypsum, brick, and other clay products and cement. The discovery of the famous Flin Flon 20,000,000-ton copper orebody, in the northern part of the province, the wonderfully rich Mandy copper claim adjoining, and numerous gold-quartz veins in the same district, together with simultaneous discoveries of gold-bearing quartz east of Lake Winnipeg, set the mining world agog with interest and awoke the province to realization of the wealth that might accrue from the development of these heretofore unknown resources.

Much exploration, involving scientific examination, study, and search, is now current in the province, and scarcely a month passes without new finds or indications being reported. Prospecting and development work have been confined largely to what are known as southeastern Manitoba and northern Manitoba.

In the southeastern section there are two outstanding mineral districts, the most important of which is the Rice Lake district. This embraces the country contiguous to the Manigotagan and Wanipigow rivers. Staking has been confined to gold-bearing quartz veins and shear zones. The principal property in this district is the Kitchener, controlled by the W A D Syndicate, of Boston, and John Taylor & Sons, of London, England. On this group of more than fifty claims, about 5,000 ft. of underground operations have been carried out, as well as a great deal of surface work. Machinery for a 150-ton mill and a 300-ton crusher was brought in last winter and is being put together this summer. More than two years' supply of ore is on the dump. The Eldorado group, 2½ miles west of the Kitchener, has been reported on favorably by engineers and geologists. A promising shear zone carrying quartz can be traced 1,800 ft. almost continuously. The company recently completed its power line to the Kitchener substation, and plans to sink a 500-ft. shaft as soon as power is available.

One of the first properties staked in the section was the San Antonio, situated near Rice Lake. This property was practically abandoned for about six-

teen years, but eastern capital then became interested in it, and further exploration is now being carried out. The vein has been traced for more than 1,800 ft. A good deal of modern machinery has been frightened in, and a three-compartment shaft has been sunk 42 ft.

The Cryderman property, owned by the Mining Corporation of Canada, 4 miles northwest of Moore Lake, looks favorable on the surface. The shear in which the mineralization has occurred seems to persist for at least 3,600 ft. The company is now diamond drilling on the tract. Considerable activity has occurred in the vicinity of English Brook, which flows into the Wanipigow River. The area is favorably situated, as summer transportation is quite feasible. The Betty group is considered one of the best prospects in this district. Development on the property includes about 800 ft. of stripping, a 50 ft. shaft, and 25 ft. of crosscutting. In the Oiseau River district interesting finds of copper, nickel, a little gold, and lithium have been made. In 1917 copper-nickel deposits were found near Maskwa River. In 1920 similar deposits were found a short distance north of the Oiseau River resulting in considerable staking of claims in the vicinity.

Northern Manitoba

The northern Manitoba district, sometimes called The Pas district, begins on the Manitoba-Saskatchewan boundary, about midway between the Saskatchewan and Churchill Rivers, and runs easterly about 125 miles, with a general breadth of 15 to 25 miles. Although a great many gold prospects have been staked out in the district, the copper finds are the most promising to date.

The most outstanding development is the Flin Flon property, which was staked in 1915. It is situated 80 miles northwest of The Pas on the Manitoba-Saskatchewan boundary. A great deal of exploration work has been done. It has been thoroughly diamond drilled to the 900-ft. level, and nearly 20,000,000 tons of ore said to average 1.68 per cent copper, 3.5 per cent zinc, with smaller values of gold and silver, has been proved up. At present the Flin Flon is controlled by the Mining Corporation of Canada, which has optioned it to the Minerals Separation Co. of California and New York. Tests carried out for nearly two years were successfully terminated when the present flotation mill functioned as expected, and experiments made at Denver were corroborated, so that there now appears little reason to doubt that early development of the property will be undertaken, and the option carried out. Over a million dollars has been spent on this property. Much more expense will be necessary for water power development, smelter, and railroad facilities.

Cryderman mine shaft and power house, Rice Lake district, southeastern Manitoba

The Mandy mine, on Schist Lake, about 4 miles southeast of the Flin Flon property, holds the record of being the first copper producer in Manitoba. Staked in 1915, it was immediately opened by the Tonopah Mining Co., of Nevada, and from 1917 to 1920 approximately 25,000 tons of copper ore, valued at nearly $2,000,000, was shipped to Trail, B. C. The high-grade ore has been mined out, but 100,000 tons running about 5 per cent copper and 17 per cent zinc are left and will probably be mined if a smelter is built at Flin Flon. As a gold area, northern Manitoba has not held out as much promise as the southeastern area. Nevertheless, many finds have been made. Activity has centered mainly around Herb Lake, Little Herb Lake, and Copper Lake.

Central Manitoba

Large developments are also afoot in the central Manitoba area. Already a power line has been built from the Manitoba Power Co.'s plant on the Winnipeg River to the Central Manitoba Mines, and the consistently good values on that property, with favorable underground work, augur well for extensive and profitable production when the mill is completed this year.

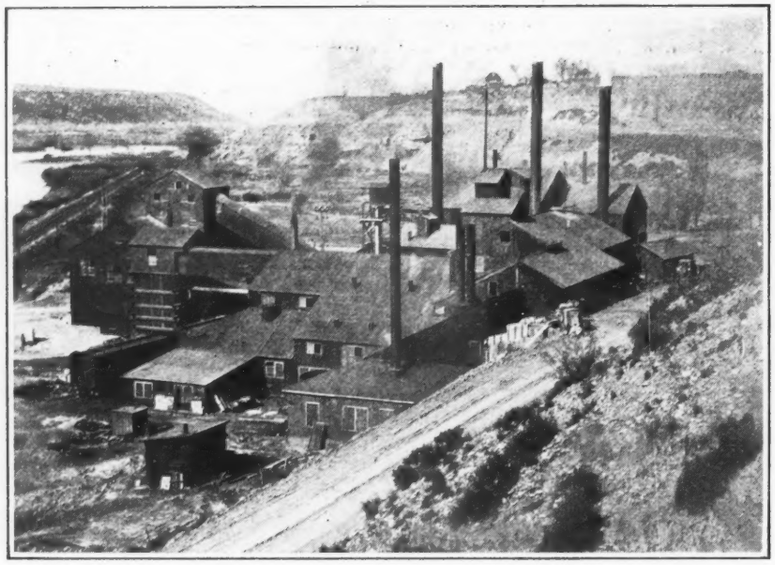
The camp at the Cryderman mine in the Rice Lake district of southeastern Manitoba.

Mining engineers are now entering the central Manitoba mining district in numbers. Many of them represent large and influential mining companies, and some of them powerful financial groups. In one section alone, the English Brook district on the Hole River, there are twelve engineers, either sampling properties or on their way in. There are as many more in the area, being rapidly extended, which now stretches from the east shore of Lake Winnipeg across to the Ontario boundary line. Already dozens of syndicates have been formed in Winnipeg, and more money than ever before is being spent on the development of the various properties. Mining machinery and supplies in increasing quantities are being shipped in, and travel by water and trail is being simplified. Airplane travel has been added to the existing means of entry into the district.

Cave-In Occurs in Waco Field of Joplin-Miami District

A CAVE-IN causing damage to the extent of $25,000 to $50,000 occurred in the Waco field of the Joplin-Miami district on Aug. 4. The mill, other buildings, and surface equipment of the Missouri-Kansas Mining Co. were dropped about thirty feet by the cave-in, which was unusual in that no jagged hole resulted in the ground but merely a sharp surface depression, ranging in depth from a few feet to more than thirty. The cave-in had been anticipated and mining operations had been stopped two weeks previously, following an inspection by Frank Fenix, state mine inspector, and G. W. Johnson, manager for the American Zinc, Lead & Smelting Co., which was operating the property on a sub-lease. It is believed there is perhaps $50,000 worth of ore in the mine pillars, and it is likely an attempt will be made to get it out. Most of the mill equipment also can be salvaged, it is thought. The cave-in was on the state line between Kansas and Missouri and stopped traffic on the state line road.

Announcement has been made of the sale of the Gascho mine of the Universal Explorations Co. to P. E. Tabor, of Joplin, Mo. The mine is in the Waco field of the Joplin-Miami district, and was purchased about two years ago by the Universal company, which had been operating it up until a short time ago. The consideration in the Gascho deal was not made officially public.



Reduction plant of the United States Vanadium Corporation at Rifle, Colo.

Colorado and Utah Vanadium Interests Consolidated

United States Vanadium Co.'s Holdings Not Included —New $200,000 Refinery Planned

REPRESENTATIVES of the United States Co., a New Jersey corporation, have announced the consolidation of most of the Colorado and Utah vanadium interests, involving the expenditure of over $1,000,000. More than 150 claims and proven sites have been purchased by this company. The vanadium mine at Rifle, Colo., owned by the United States Vanadium Co., was not included in the deal, however.

A $200,000 refinery has been decided upon, but as yet the site has not been selected, although Denver, Newcastle, and Rifle are being given the most serious consideration. The new plant planned by the United States Co. will have a capacity of 100 tons a day, will be electrically operated and will turn out a product which is 90 per cent vanadium pentoxide. The consolidation includes 30 claims in San Miguel County, Colo.; 45 claims at Long Park, Colo., taken over from the United States Radium Co.; 47 claims formerly owned by the Colorado Radium Corporation at Gateway, Colo.; and 26 claims at Dry Valley, Utah, in the southeastern part of the state. Some of these properties are already producing vanadium ore.

Surface plant at the mine of the United States Vanadium Corporation

The reduction plant of the United States Vanadium Corporation at Rifle, Colo., and the company's mine 12 miles west of Rifle are shown in the accompanying photographs. The mill is of 100 tons' daily capacity, and the ore is hauled from the mine to the mill, on trucks. This occurs in gray sandstone and is treated by roasting and cyaniding. Mine and mill employ about 125 men. A small tonnage of vanadium-bearing ores is mined in the vicinity by other producers, the product being treated by this plant. The United States Vanadium Corporation is a holding company, the Union Carbide Co. being the parent company.

Anaconda to Treat Smelter Slag at New Plant

Operations to Begin Oct. 1—U. S. Geological Survey to Investigate Manganese Possibilities

ANACONDA Copper Mining Co. is making good headway in the construction of a plant to handle slag from the East Helena smelter. J. R. Hobbins, vice-president of the company, has given out the following announcement:

"On a site adjacent to the East Helena smelter, on ground leased from the American Smelter & Refining Co., the Anaconda Copper Mining Co. is constructing the first unit of a two-unit plant for the treatment of current molten smelter slag. This unit will include a furnace, combustion chamber, flues, baghouse, compressor plant, and coal-pulverizing plant. Construction, which started about June 1, is rapidly progressing. The plant will be of brick and steel, and it is expected that it will begin operations about Oct. 1, employing forty men.

"Here it is planned to treat 200 tons of molten slag per day. From these slags it is designed to make zinc-lead oxide, suitable for treatment at our electrolytic zinc plants at Great Falls or Anaconda. In the event that results achieved by the present unit warrant, the plant will eventually be enlarged to a 500-ton daily capacity and will employ in the neighborhood of 100 men."

W. C. Siderfin, of the W. A. Clark interests, of Butte, recently returned from the manganese conference at Washington, D. C., accompanied by John H. Cole, of Anaconda. Mr. Cole is head of the Domestic Manganese & Development Co., which has bought the property of the old Butte Reduction plant, and will equip it for the concentration of the "pink" manganese ores of Butte. The plant will be of 250 tons' daily capacity. Mr. Siderfin stated that the U. S. Geological Survey will send two field men to Butte to aid in the determination of the manganese possibilities of the district.

The Butte stockholders committee of North Butte Mining Co., expect to call a special meeting of all stockholders at an early date to demand the resignation of directors who were responsible for putting the company in the hands of a receiver. The receivership proceedings were set aside by a recent decision of Federal Judge Bourquin.

Searchlight Mining & Milling Co. has been incorporated by W. H. Hickam, J. W. Scheets, and C. W. Graves, of

Sheridan, and Ira D. Fisher, of Idaho Falls, to take over the old Paymaster properties and additional joining claims. This gives the company five claims, which are in the Ramshorn unorganized mining district, located about 16 miles southeast of Sheridan. The company has a body of gold-silver ore blocked out and is planning to build a mill.

Wishard Mountain Mining Co., organized last year will soon start mining operations on the headwaters of Big Creek, south of DeBorgia, Mont., according to John F. Siders, president.

It is reported that development work in the tunnel on the Butte-Metals claims of the Butte-Colorado Mining Co. properties has opened a strong lead. The company has 140 acres in the Little Pipestone district.

According to I. O. Proctor, consulting engineer for the Saco Mining Co., operating the High Up mine, near Virginia City, the enlarged mill of the company will start operations within a month.

Many New Developments at Arizona Properties

THE new strike on the 700 level of the Aztec mine, at Oatman, Ariz., has enabled the Tom Reed company to increase the tonnage put through the mill to 100 tons daily. The limits of the new orebody have not yet been determined, but development work is continuing, and manager Shank has hopes that the oreshoot will be 700 ft. long. Its width is about 15 ft. Stopes on the new shoot, together with other Aztec stopes, are producing 60 tons daily of ore that is higher grade than any mined by the Tom Reed since the property was reopened. The other 40 tons are coming from the Ben Harrison claim, where a drift on the 300 level has encountered a good vein 20 ft. wide.

At the Baltic property contractor Ross Barclay has sunk the shaft 550 ft. and will continue it 150 ft. further before drifting is started. At the Katherine Treasure Vault property, 30 miles north of Kingman, the shaft entered a vein at a depth of 490 ft. which is still in the shaft at a depth of 520 ft. It is apparently the same vein that was encountered in the crosscut from the 450 level, although it carries better values. The shaft will be continued to the 600 level.

The old Carlisle mine, 13 miles east of Duncan, in the Steeple Rock district, is being developed by the United Metals Corporation, of which Roland Blanchard, formerly geologist for the Copper Queen at Bisbee, is president and general manager. Associated with Mr. Blanchard are Alfred Strong Lewis and F. P. Boswell. The main shaft is being unwatered and retimbered, and is now down 500 ft. with a winze to the 627 level.

The low price of lead has necessitated reduction of the working force at a number of properties, among which is the Aravaipa Mining Co., 60 miles west of Safford, which is reported to have closed down its mill indefinitely, throwing approximately 50 men out of employment. The Aravaipa company, of which Congressman Lewis Douglas is president, owns a large group of claims in Aravaipa Canyon, the deposit consisting of sand carbonates, with galena in part of the property. Recently a new strike was reported on the property. The company is somewhat handicapped by a 50- to 60-mile haul over the mountains to the railroad. However, it is believed that the county and the company in conjunction will eventually build a shorter road.

THE ownership of 640 acres of land adjacent to and southeast of the Bisbee Queen is being contested before a United States land commissioner in Bisbee. The contestants are Dan Angius, J. B. Tenney, Glen McLaughlin, Charles R. Woods, and Mark Barley. The contestees are Mrs. Pearl E. Armstrong and heirs of Mary E. Steppe.

The Katherine Gold Mining Co. has started drifting from the 900 level, and work will be carried into the two veins lying at varying distances from the shaft. It is expected that the larger vein will be encountered in a short distance, the shaft below the 600 having been carried through the orebody, and that the other vein will be reached between 250 and 300 ft. from the shaft.

To date the Shattuck Denn Mining Co. has sunk five holes in the diamond-drilling campaign begun jointly with the Calumet & Arizona Mining Co. early last spring. The holes are being sunk in and around the John-Daisy group of claims, which are owned jointly by the two companies and which are in the vicinity of the town of Lowell. All of the holes are at least 1,000 ft. in depth. One more hole will be sunk in this vicinity before the drilling campaign is brought to a close. So far, drilling results have not been announced.

Glencoe property of the Park Galena Mining Co. near Park City, Utah

Park Galena Equips Glencoe Mill to Treat 100 Tons

SINCE acquiring the old Glencoe property, situated on the east limb of the Park City, Utah, anticline near the Park Utah mine, the Park Galena Mining Co. has made considerable progress toward putting the mine on a permanently productive basis. Operations were begun last September; one and a half miles of road has been built; a loading station is to be constructed at the Park Utah loading station of Keetley, two miles distant; the mill is being converted into a selective flotation plant; ore has been produced steadily; and the Glencoe fissure opened up on the 200 level, 200 ft. below the main tunnel level and 400 ft. beneath the surface.

Productive from the grass-roots down, the old Glencoe mine has been handicapped in the past by lack of adequate finances for development and systematic exploration. On the 200 level, in the diorite, the Glencoe vein has been proved ore-bearing for the entire distance of 350 ft. The width of the ore varies from 4 to 16 ft. The higher values are found in that segment of the vein east of the shaft. Close to the point where the Park City limestone should be entered, 16 ft. of ore has been opened up without exposing either wall of the vein.

Sixteen flotation machines and filtering equipment have been purchased for installation in the mill. By the addition of this equipment and using the crushing machinery already in the mill, the company expects to be able to treat 100 tons of ore daily. Sinking of the shaft to the 400 level and exploration east and west along the Glencoe fissure will also be undertaken by the company in the near future. A general view of the property is shown in the photograph above.

News From Washington

Decreasing Amount of Work Done at Bureau of Mines Stations

Causes Expressions of Concern from Mining Interests—Insufficient Funds Available for Major Research Problems

MINING interests directly concerned with the work of the experiment stations of the U. S. Bureau of Mines are manifesting concern because of the decreasing amount of work being done at those regional centers of research. In 1915, when $25,000 was agreed upon as the minimum amount that would be required for each station, the work was undeveloped. The stations were too new to plunge into major problems. The appropriation was ample while they were finding themselves. They began by undertaking minor problems, for the most part—work that did not require much equipment or large expenditures for labor and materials. Prices of supplies and materials have increased and the level of technical salaries has gone up to such an extent that the $25,000 of 1915 now is equivalent only to $18,000. When the necessary supervision and overhead are deducted, the amount remaining is insufficient with which to attack any major research problem.

It is considered by some that $50,000 is the minimum amount that should be allotted to a station. This would be much less than the average expended at agricultural stations. Moreover, studies of mining problems usually are more costly than are agricultural experiments. There also is a feeling that if Congress is not willing to appropriate $50,000 for each of the Foster stations, it would be better to retain only the number of stations for which Congress is willing to provide $50,000.

THE manuscript of the first government bulletin ever written on geophysical methods of prospecting is now in the hands of J. E. Spurr, who has been retained by the Bureau to act in an advisory capacity to the group of research men now engaged in studying the engineering and geological phases of the investigation.

Drilling now is in progress on the Bureau of Mines' fourth potash well. This well, which is in Ector County, Tex., will be drilled to a depth of 2,000 ft. It is expected that the drill will reach the salt bed at a depth of 1,000 ft. The third well, which is in New Mexico, is 50 per cent complete. Leases now are being negotiated with the land owners on four additional sites in Texas selected by the U. S. Geological Survey. Two of these sites are in Upton County, one in Crane County, and one in Crockett County.

Preparation of the annual report of the Bureau of Mines covering the fiscal year ended June 30 has begun. Emphasis will be placed in this report on the accomplishments of the year. There will be a summary of the year's publications. More attention is to be given general information in regard to the business of the Bureau. The expenditures, by subjects, will be compared with those of other years. The money expended by the branches will be analyzed. This part of the report is to be made similar to the annual report that would be made by the management of a private company to its stockholders.

Important changes in the carload freight rates on scrap lead and zinc from Pittsburgh to destinations in trunk-line and New England territories have been approved by the Interstate Commerce Commission. The changes were opposed vigorously by the Federated Metals Corporated, operating smelting plants at Trenton and Newark.

The result of the change on the Pittsburgh and Lake Erie is to make the commodity rate of 23c. applicable on scrap lead and zinc and the sixth class rate of 28.5c. on pig lead and slab zinc. This is the reverse of the situation under the Pennsylvania tariff. The superseded Pennsylvania tariff made the same rate, 19c., applicable on pig lead and slab zinc, as well as on scrap lead and zinc, while the new schedule cancels that rate on scrap but permits it to remain on the primary metals. Under the superseded Pittsburgh and Lake Erie tariff, both the primary metals and the scrap took the same rate from Pittsburgh, 28.5c., but the new schedule reduces the rate to 23c. on the scrap and allows the sixth class rate of 28.5c. to remain in effect on the primary metals. Commissioner McManamy dissented from the decision, saying: "The increases proposed by the Pennsylvania result in rates on scrap higher than those on the primary metals. This is contrary to the usual rule of rate making. The carriers have introduced no evidence to show that this improper adjustment would not operate to the undue prejudice of protestants, nor have they shown that undue prejudice would not result because of the relatively lower rate between Chicago and New York. The carriers have, therefore, failed to meet the burden of proof placed on them by the act. For the above reasons, I believe that the suspended schedules of the Pennsylvania should be found not justified."

Montana A.I.M.E. Members Hold Meeting at Butte

IN HONOR of E. L. DeGolyer and Dr. H. Foster Bain, president and secretary respectively of the American Institute of Mining and Metallurgical Engineers, the Montana section of that body held a dinner at the Silver Bow Club, Butte, on Aug. 6. Both Mr. De Golyer and Dr. Bain talked to the assembled members, and it was unanimously voted that the Montana section immediately draft resolutions to be presented to President Coolidge, to Secretaries Hoover and Work, and to Montana's four representatives in Congress, asking that the U. S. Bureau of Mines and the U. S. Geological Survey be allowed larger appropriations.

After the business meeting President DeGolyer gave a talk on petroleum prospects. F. Wartenweiler, formerly of Butte, but now having business associations in the Rand district of South Africa, gave a talk on African mining methods. The leading paper of the evening was read by C. P. Woodward, of the mechanical department of the Anaconda Copper Mining Co., who gave a detailed description of the 2,150-hp. new electrical hoist recently installed at the Belmont mine. He stated that the top of the headframe is 129 ft. above the collar of the shaft, and that the skips used hold seven tons of ore. Other speakers of the evening were Dr. C. H. Clapp, president of the University of Montana; B. E. Silbey, of the Continental Oil Co., Denver, and E. D. Gardiner, of Arizona.

After leaving Butte, Mr. DeGolyer and Dr. Bain, accompanied by some of the local section officers, were taken to visit mines in the Philipsburg district and over the new Skalkaho Road to Missoula, from which point they departed for Spokane.

Civil Service Examination for Geophysicists

The U. S. Civil Service Commission announces the following open competitive examination: Senior Geophysicist, $5,200, and Geophysicist, $3,800.

Applications for the examination must be on file with the commission not later than Sept. 13. The examination is to fill vacancies in the U. S. Bureau of Mines and in positions requiring similar qualifications. The duties will be, under general direction, to plan and conduct investigations in geophysical prospecting and allied subjects and, if required, to supervise a small group of physicists, geologists, and engineers associated in such investigations. The duties will require office and field work and the preparation of reports and articles for publication. Full information concerning the examination may be obtained from the U. S. Civil Service Commission, Washington, D. C., or the secretary of the board of United States civil service examiners at the post office or custom house in any city.

Toronto Letter

By Our Special Correspondent for Northern Ontario

Development of Large Scale Operations in Progress in Sudbury District

TORONTO, Aug. 6—There is considerable activity in the Sudbury area, and much new work going on, particularly in the lead-zinc district. The principal operations are at the properties of the Yukon-Treadwell Co., which is generally referred to as the Bunker Hill & Sullivan. One shaft is down 300 ft., and at this level a drive is being run to connect with No. 2 shaft, which has been started, a distance of 3,600 ft. away. About half of the distance has been driven, and fast progress is being made. The ground between these shafts has been extensively drilled, with very encouraging results. No effort, however, is being made to develop ore, as the object is to connect these shafts as rapidly as possible so as to provide ventilation and to permit the opening up of the orebodies in a large way. The company is handicapped on account of the lack of power, as the only plant is a small steam unit, but connection with the Wahnipitae Power Co. will be made within the next month, and a large compressor will be installed. A number of permanent buildings have been erected and excavations have been made for a pilot mill. The National Lead Co. is diamond drilling the extension of the strike at one end of the properties and the Book Cadillac interests of Detroit are drilling at the other end. A number of engineers and geologists are in the district looking up properties, but exploration is extremely difficult, as the great part of what is generally termed the "Sudbury basin" is heavily covered with overburden. On the other side of the "basin" good progress is being made in sinking the Frood shaft of the International Nickel Co., which is now down 1,500 ft.

At the Argonaut property a large development program has been decided upon. This will involve the sinking of a vertical 500 ft. shaft to connect with the winze which was sunk from the 500 to the 1,250 level. The new shaft will have three compartments, and the winze will be enlarged to the same dimensions. A new compressor is being purchased, and the new shaft will be equipped with a new and larger hoist. As soon as this work is completed the shaft will be continued below the 1,250 level to open up the new veins found at that point. During the process of enlarging the winze it will probably be necessary to close the mill, as there is not a great deal of ore left above the 500 level. The company has been greatly handicapped on account of the inadequate hoisting facilities. Developments during the last year have indicated that the most favorable part of the property lies a considerable distance from the present shaft, and this is considered to be of sufficient importance to justify an extensive campaign of development. The company was recently refinanced, and is understood to have $300,000 cash in the treasury.

At the Amulet property three more diamond drills are being contracted for, which will bring the total number up to five. The president of the company stated that so many new discoveries were being made that the original two drills were making more work for themselves than they could handle.

A start has already been made in laying the steel on the Nipissing Railway extension into the Rouyn district of Quebec. Excellent progress has been made and the work as a whole is up to schedule. About 1,100 men are employed on this work.

Unit of Noranda Smelter Nearing Completion

PREPARATIONS for beginning production at the Horne smelter of Noranda Mines, Ltd., Rouyn district, Quebec, are fully up to schedule. Blister copper will be turned out in October. One of the two units is being rushed to completion by that time and the other will be finished later.

Some interesting discoveries of high-grade chalcopyrite and gold ore have been investigated during the last month. These newly found ore occurrences are most important, indicating that there is promising unexplored ground quite close to the area in which mining operations have been conducted during the last three years. Further exploration on the "G" orebody and of the surface discoveries made a short time ago near No. 2 shaft continue to emphasize their importance.

Since only a small fraction of the Horne property of 600 acres has been explored to date, there remains considerable promising ground to be examined. Just now all attention is being paid to making the mine ready for handling ore. The shaft is down approximately 550 ft. About the beginning of September the station will be at the 600 level and lateral work will begin at the lower horizons.

London Letter

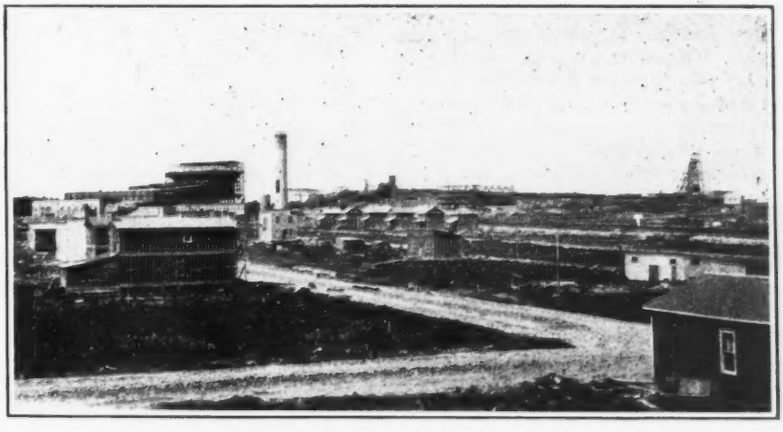
BY W. A. DOMAN
Special Correspondent

Rhodesia Broken Hill to Handle 55,000 Tons at New Plant

LONDON, July 29—At the annual meeting of the Rhodesia Broken Hill Development Co., Sir Edmund Davis stated that as delays had been experienced in sending out plant, as a result of the general strike in this country last year, the directors had in certain respects taken up an attitude of their own. They have erected their own lead-rolling plant and have been able to manufacture all their own requirements of lead for the new plant. The company has also supplied the Union Minière with lead for some of its plant. In view of the increase in operations, the directors hope to be able to augment the water supplies at Mulungushi, but government consent must first be obtained. Sir Edmund Davis further stated that the unit of plant which will be in operation this year will handle 55,000 tons of ore per annum.

Honors in the mining market on the day immediately preceding the August bank holiday were carried off by West African companies. The Ashanti Goldfields Corporation has received further information from Obbuassi concerning developments in the Ashanti mine. Three crosscuts have been driven on No. 22 level. The first shows the reef to be 72 ft. wide, with an average assay value of 44.8 dwt. Crosscut No. 2 is in reef 20 ft. wide, with an average value of 34 dwt. As a reef, presumably the same, has been cut on No. 21 level, the ore reserves may be materially increased.

An attempt is to be made to give a new lease of life to the Abbontiakoom mine in West Africa. As the result of an examination it is officially stated that the silver content of the available ore is greater than that of the ore previously mined. At the same time, the gold content is less, and it has become necessary to decrease the reserve tonnage.



Noranda townsite and smelter, Rouyn district, Quebec

Mexico City Letter

By W. L. Vail
Special Correspondent

Chihuahua Chamber of Mines Urges United Effort to Save Mining Industry

Mexico City, Aug. 8—The Chihuahua Chamber of Mines has issued an appeal to the various chambers of mines, chambers of commerce, industrial chambers, and other business organizations throughout Mexico urging a united effort toward some plan to save the mining industry of the country from disaster. The Chihuahua chamber is very pessimistic concerning the present situation of the industry.

An open letter has also been addressed to the national Secretary of the Treasury, setting forth the alarming conditions confronting the mining industry, as seen by the members of the organization. The letter asks for the remission of all taxes on properties working low-grade ores and for a considerable reduction of consular fees and import duties on machinery and mining supplies coming into the country. It also calls attention to the fact that a number of properties have already closed, with or without consent of the federal government authorities.

THE decision of the federal government, in conjunction with the banks, to arbitrarily "peg" an artificial exchange ratio between the Mexican silver and gold peso at a fixed discount rate of 6 per cent, will enable the government, if the plan succeeds, to bolster up its silver currency. The attempt will be watched with interest.

Martin J. Conroy, president and general manager of the Copalitos mines, in Sinaloa, is now in New York City, it is understood, arranging for additional machinery for the company's properties in Mexico. The company claims that it will be able to start the 100-ton plant, now under construction, within the next eight months. Erection of an additional plant of equal capacity at Lobitas, 10 miles distant from Copalitos, on property owned by the company, is also planned. An airplane freight and passenger service between Los Angeles, Calif., and the mines in Sinaloa is promised by the first of October. Much of the construction work at the mines in the district is held up at present on account of the heavy rains.

It is reported that the differences between the mine owners and workmen at Wadley, San Luis Potosi, have been adjusted and that work has been resumed. Also, from San Luis Potosi comes the information that the railway between that city and Villa Pozo has been completed, by the Asarco company. The railway is to be used primarily as an ore road; it will be extended as far as Ojo Caliente and Santa Maria del Rio.

Old Ophir Camp Scene of Much Exploration

OPHIR, UTAH—a district with a production record of $51,000,000, beginning in the early sixties, and the stamping ground of such famous pioneers as General Connor, the founder of the Utah mining industry, Marcus Daly, W. S. Godbe, and the Walker brothers—is the center of much attention after being inactive for several years. All of the exploration now under way in the old camp has for its objective the development of the Ophir formation in faulted areas below the surface deposits mined in the past. It was the Ophir formation that produced more than $25,000,000 in the late Senator W. A. Clark's Ophir Hill Consolidated property. This series of limestones is also the locus of the silver-lead deposits in the Bingham, Tintic Standard, and North Lily properties.

The Clark interests, under the direction of Charles W. Clark, have sunk a shaft 1,400 ft. on the Lion Hill side of the camp, where diamond drilling proved several years ago that the Ophir formation existed at depth. A new hoist is to be installed, a sump sunk 50 ft., and drifting along the quartzite contact is to be started immediately under the direction of H. M. Hartmann, manager. The Ophir Mono Mines, Inc., headed by M. C. Godbe, has installed a ten-drill compressor, and is running four headings to explore at depth the Mono, the Queen of the Hills, the Garber, the Brookly, and the Wandering Jew properties, all heavy producers from grassroots in the early days. The J. R. Walker interests associated with Evans and Hubbard are developing the Chloride Point—located by General Connor in the early sixties—the Clussy, and other historic claims. Joe Ericson, a veteran miner of the camp, has started development of the old Kearsarge property. A compressor has been installed and a tunnel is being run at depth. The Antarries group, the Buffalo, and other claims are being developed.

FOLLOWING the negotiation of vertical boundary agreements with its neighbors, the Ohio Copper Co., operating at Bingham, Utah, has found by diamond drilling that the important ore-bearing limestones of the camp, the Commercial and the Yosemite, and probably the Jordan, lie at depth in the south end of its property. Drifting from the company's three-mile Mascotte tunnel has been started to explore fissures in the limestones, which in neighboring properties — the United States, the Bingham Mines, the Utah Apex, the Utah Delaware—have been heavily mineralized.

Leaching-in-place operations of the company are yielding between 400,000 and 500,000 lb. of copper monthly. Production has been appreciably increased by the introduction of a small amount of sulphuric acid into the water used for surface irrigation of the areas above the caved orebodies.

Melbourne Letter

By Peter A. Tait
Special Correspondent

Port Pirie Smelter Opposes Shorter Week Plans of Employees

Melbourne, July 12—An important statement bearing on the cost of smelting Broken Hill silver-lead concentrates at the works of the Broken Hill Associated Smelters, located at Port Pirie, has been issued by the directors of the company. The statement has been prompted by the gradual fall in the price of lead and by the movement on the part of the employees to share with those connected with other industries the advantages of a forty-four hour week. It is pointed out that the company has spared neither effort nor money to modernize the equipment of the works and to provide for the welfare of its employees. The directors claim that today the metallurgical practice at Port Pirie is equal to that of any of its overseas competitors, and that the conditions under which the men work are unequaled at any lead smelter in the world. On the other hand, owing to the higher wages and increased prices of coal, coke and freights, the company's costs of smelting and landing its products on the world's markets exceed those of its principal competitors abroad. This means that the Broken Hill mining companies receive less for their output than would be paid by overseas competitors for the same material.

THE adoption of the forty-four hour week in other industries will have its effect on the company, but if in addition to this the employees of the smelting works demand the same hours the company, says the statement, "will be forced to take the earliest opportunity to obtain relief from costs in other directions, either by negotiations with the unions or application to the courts." If that fails it is stated plainly that extreme action may necessitate the closing of the works. The Broken Hill Associated Smelters, fortunately, has been able to maintain harmonious relations with its large staff, but, with the shorter hours ruling at Broken Hill and becoming almost universal throughout Australian industry, it is not unnatural for the employees at Port Pirie to seek similar concessions. It is hoped, however, that their leaders will realize that the smelting industry has to meet its production costs by the sale of its products, not on an Australian basis, but on the prices ruling on the markets of the world.

The Taranaki Oil Fields, Ltd., of New Zealand, which has been negotiating with the D'Arcy Exploration Co., a subsidiary of the Anglo-Persian Oil Co., has decided not to proceed further with the negotiations, as the terms offered are not satisfactory.

Situation at the Mines

Sentiment at Mines Improves With Turn in Non-Ferrous Metal Prices—Limited Curtailment Prevails—Gradual Increase in Production Expected

By H. D. Keiser
Assistant Editor

REACTING with the recent upward turn in non-ferrous metal prices, sentiment among metal-mine operators shows considerable improvement. Some curtailment continues, but in most of the districts an optimistic viewpoint prevails, and it is hoped that a gradual increase in production will be warranted during the fall months. There is a noticeable increase in the amount of exploration and development work now under way in many sections, and a pronounced revival in mining activity is looked for during the remainder of the year.

Copper

After a temporary slump in the early part of July, copper is again moving briskly both by boat and rail from the smelters of the Michigan district. Mine production is increasing and the companies are adding to their underground forces. Calumet & Hecla has announced plans for the construction of another furnace at its smelting plant at Hubbell. The furnace will have a capacity of 600,000 lb. at one charge and will increase the smelter's capacity to 20,000,000 lb. of copper per month. Considerable exploration and development work is current in the district. At the Copper Range group of mines, from which large shipments are being made, the most vigorous development policy of years is in progress. The Mohawk property continues at a high rate of production, and its July output is expected to equal that of June, which was the best month of the mine's history. Repairs are being made to No. 2 shaft at the Quincy mine, in which fire broke out July 13, and it is planned soon to have the shaft in commission again. Industrial conditions in the district have shown a marked improvement. This is indicated by the fact that recently when 125 men were given employment by Calumet & Hecla it was found that most of them were from points outside the district.

Extensive development operations and little change in production prevail in the Arizona camps. At Noranda Mines, in the Rouyn district of Quebec, Canada, erection of the smelter is progressing according to schedule. It is stated that one unit of the plant will be producing blister copper in October.

Lead and Zinc

Operations in the Joplin-Miami district continue quiet, but with indications that gradually increased production will come with the fall months. For the week ending July 30 production of zinc concentrates amounted to 13,536 tons. Of this amount 1,349 tons was high-grade ore, and 1,409 tons was produced by tailing mills. Output of lead concentrates for the week was 1,665 tons. At the end of the month there were 37,223 tons of zinc concentrates in bins, of which 15,730 tons were sold and 21,493 unsold. There were 14,955 tons of lead concentrates in bins, 715 tons of which was sold. Although the price of lead concentrates increased from $75 per ton, 80 per cent basis, during the early part of the month, to $82.50 on July 30, operators showed little inclination to dispose of reserve stocks in bins. There were 128 mills operating, an increase of twenty over the number operating at the close of June. Eight mills were operating double shift and twenty-eight were treating tailings.

The advance in the price of lead has had a most stimulating effect upon the mining industry in the Cœur d'Alene district, Idaho. Though the low price, 6.20c. New York, had not resulted in suspension of production or curtailment to any great extent, the apprehension that these measures would become necessary, if the price was further reduced, naturally produced a rather depressing effect throughout the district. The most noticeable phase of the situation was the difficulty in securing funds for new mining development, with the result that up to this time there has been less activity in that line than for several years. The upward movement in the price of lead, at this writing from 6.20c. to 6.50c., together with the prevailing feeling that the advance will continue and probably pass 7c. by early fall, has given an optimistic outlook to the situation, and a pronounced revival in mining activity is confidently expected during the remainder of the year.

Lead-Silver

During July production fell slightly at the Utah mines as a result of a three-day holiday at the beginning of the month and the elimination of Sunday work at some properties. Curtailment, however, did not exist to a material extent. Active exploration prevailed at many mines, particularly at those in the Tintic district. Recent developments at the North Lily and Eureka Lily properties indicate an expansion of production and activity in the near future for the east-side section of the district.

Combined Metals Reduction Co., of Pioche, Nev., has materially reduced the scope of its operations owing to the present price of lead, a 50 per cent reduction in the working force taking place during July. Operations will be confined to development work. The San Rafael company, operating in the Quartz Mountain district, is shipping a good grade of lead-silver ore to Utah smelters. Treadwell-Yukon, in the Tybo section, is opening up important lead-silver orebodies on the 700 level of the 2-G mine.

Gold and Silver

Conditions in the Tonopah district of Nevada continue unchanged, with July production valued at approximately $150,000. In the Divide district leasers on the Brougher Divide property have opened up promising orebodies, the most interesting development being on the Thomas block. At the White Caps mine, in the Manhattan district, a new ore find has been made on the 1,120 level. Shipments from the Ben Hur property, in the Bellhelen district, show a good grade of ore. Flowery mines, in the Virginia City area, are milling 200 tons of low-grade gold ore per day. Ramsey mine, in the Ramsey section, reports important ore developments on the 500 level, with the values practically all in gold. The Weepah camp, now five months old, is quiet and shows little change. However, interest in the development operations in progress continues, and the *E.&M.J.* correspondent for the district states, "If enthusiasm and money hold out long enough, Weepah may force some of its malignners to about face and become imbued with the desire to return and see what a mining camp looks like when it gets its second wind."

Iron

Shipments from the iron ore mines of the Lake Superior region during July amounted to 8,609,082 tons, a reduction of 1,397,011 tons from the movement of July, 1926. The total to Aug. 1, this year, is 26,380,505 tons, or 1,480,613 tons more than for the corresponding period of last year. One of the largest producers, Pickands, Mather & Co., has started to curtail operations at some of its underground mines in the Michigan field. At several of the properties the working schedule has been reduced to five days per week, and at one of the big mines the men are working on a four-day basis. It is said that some of the furnace interests have cut down their requirements for the season. The Ford Motor Co. has about completed the installation of surface equipment at its Blueberry mine and is now working three shifts of miners in sinking the shaft. This same company has placed three diamond drills in operation on its Richards property, on the Menominee range. Outside of the drilling being done by Ford, practically no exploratory work is in progress on the ranges.

Societies, Addresses, Reports

Final Plans for Empire Mining and Metallurgical Congress

Opening Sessions in Montreal—Technical Papers to Be Presented at Meetings in Seven Cities

FINAL PLANS for the second triennial Empire Mining and Metallurgical Congress to be held in Canada from Aug. 22 to Sept. 28 have been announced by the Canadian Institute of Mining and Metallurgy.

The opening sessions of the Congress will take place on the morning of Aug. 22 at the Windsor Hotel, in Montreal. Addresses will be made by Sir Robert Horne, honorary president of the Congress, and Charles Stewart, president, and Minister of Mines of Canada. The official banquet will be held on the evening of Aug. 23 at the Windsor Hotel, with E. W. Beatty, chancellor of McGill University, presiding. The special trains for Tours "A" and "B" to the principal mining centers of Canada will leave Montreal shortly after the banquet.

Meetings and technical sessions will be held as follows: Montreal, P. Q., Aug. 22-23; Toronto, Ont., Aug. 25-26; Winnipeg, Man., Sept. 3-4; Quebec, P. Q., Sept. 5 and 26; Sydney, N. S., Sept. 9-10; St. Johns, Newfoundland, Sept. 12-14; Vancouver, B. C., Sept. 15-16; Edmonton, Alta., Sept. 20.

During the visit of the Congress to Toronto on Aug. 25 a model of a late fifteenth century galleon, worked entirely in pure nickel, an exceptionally fine piece of craftsmanship, will be presented to the Ontario Department of Mines by the Mond Nickel Co. The model is shown in the accompanying photograph.

The following complete program of the papers to be presented at the Congress has been announced:

Montreal Meeting—"Proposed Review of the Mineral Resources of the Empire," by Sir Thomas H. Holland; "Magnesia Refractories for Steel Furnaces," by G. M. Carrie and C. F. Pascoe; "Smelting Titaniferous Iron Ores," by A. Stansfield; "Portland Cement in Canada," by W. A. Toohey; "Progress in Research on Health and Safety in Coal Mines, 1924-1927," by J. S. Haldane and R. V. Wheeler; "An Outline of Mining and Metallurgical Practice in Australia," Vol. I, by leading authorities in collaboration; Vol. II, "The Utilization of Brown Coal," by H. Herman.

Toronto Meeting—"Nickel, Past and Present," by R. C. Stanley; "Precious Metals in the Sudbury Ores and Their Recovery," by C. Langer and C. Johnson; "The Silver Mining Industry in Canada," by Arthur A. Cole; "Deep-Level Mining and High Temperatures," by A. Mavrogordato and H. Pirow; "Cascade Method of Pouring Steel," by J. G. Morrow.

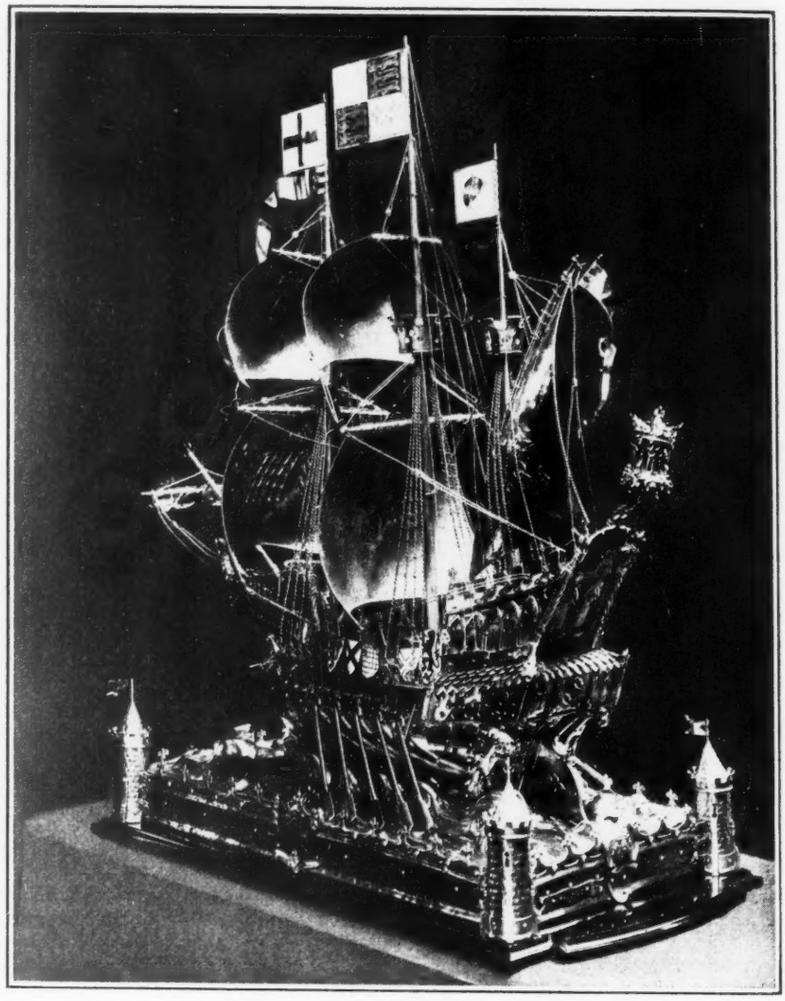
Winnipeg Meeting—"The Development of Gold Mining in Canada," by George E. Cole; "Method of Eliminating Barren Rock from Ore at the Sub Nigel Mine," by W. A. Quince; "A Brief Review of the Principal Base-Metal and Base-Mineral Resources of the Union of South Africa," by C. J. N. Jourdan; "Notes on the Operation of the Reduction Plant at West Springs, Ltd.," by Carl R. Davis, J. L. Willey, and S. E. T. Ewing.

Quebec Meetings—"Possible Auxiliary Sources of Liquid Fuel," by A. W. Nash; "Asbestos Mining and Milling," by J. G. Ross; "The Sinking and Equipment of the Ventilation Shaft of the Government Gold Mining Areas," by A. Job; "The Tipping and Guiding of Vertical Skips," by G. W. Sharp; "Improvement in Drilling Efficiency with Jackhammers," by P. M. Newhall and L. Pryce.

Sydney Meeting—"Mining Coal Under the Sea in Nova Scotia," by F. W. Gray; "The Metal Manganese and Its Properties"; also the "Production of Ferro-manganese and Its History," by Sir Robert A. Hadfield; "India's Resources in the Raw Materials for a Domestic Iron and Steel Industry," by C. S. Fox; "The Manufacture of Steel in India, by the Duplex Process," by B. Yaneske; "Coal Washing at the Linsi Mine, Kailan Mining Administration, North China," by Alex. Docquier, L. Bataille, and R. Beetlestone.

Vancouver Meeting—"Canadian Copper and Its Production," by C. P. Browning; "Lead and Zinc in Canada," by T. W. Bingay and F. J. Alcock; "Dewatering the Lower Levels of the Simmer and Jack Mines, Ltd.," by R. Craib; "The Contact Process for the Manufacture of Sulphuric Acid From Blende Roaster Gas," by Stanley Robson; "A New Form of Air Meter and the Measurement of Compressed Air," by E. J. Laschinger.

Edmonton Meeting—"The Coal Industry in Western Canada," by R. Strachan, W. J. Dick, and R. J. Lee; "Petroleum in Canada," by W. A. Bell, R. B. Harkness, G. S. Hume, O. B. Hopkins, and S. J. Cook, with an introduction by John Ness; "Conditions Affecting the Petroleum Prospects of the Empire," by Sir Thos. Holland; "Economics of the Petroleum Situation in British Dominions," by Sir Frederick Black; "Progress and Prospects of Oil Production," by E. H. Cunningham-Craig; "Petroleum Refining Facilities Within the British Empire," by James McConnell Sanders; "Impact Resistance of Steels at Low Temperature," by A. E. Cameron and I. F. Morrison.



Nickel model of fifteenth century galleon

Personal Notes

PHILIP D. WILSON has returned to New York after a six weeks' trip in Mexico.

GEORGE H. GARREY has returned to his Philadelphia office from mine examination work in Nevada.

H. W. C. PROMMEL, Denver consulting geologist, spent several weeks recently in southwestern Utah making a reconnoissance.

C. F. JACKSON has returned to the United States from South America, where he spent three months on professional business.

CHARLES SPEARMAN, mining engineer, has been placed in charge of work on the holding of the Capital-Rouyn in northwestern Quebec.

DOUGLAS A. MUTCH, consulting engineer, has been appointed to take charge of operations on the properties of the Rubec Mines, Ltd., in the Rouyn area of Quebec.

DR. A. W. ROGERS, Director of the South African Geological Survey, and Mrs. Rogers recently made a fortnight's holiday tour through the Northern Transvaal.

DR. W. S. MCCANN, consulting geologist of London, is visiting Canada on business. He has recently investigated the bauxite deposits of the Gold Coast Colony.

CAPTAIN J. LINDSAY ALLAN, of London, England, representative of a British syndicate interested in Canadian mining, is in Manitoba investigating opportunities for investment.

RICHARD C. PATTERSON, JR., a graduate of the Columbia School of Mines, has been appointed Commissioner of Correction for New York City. He succeeds Frederick A. Wallis.

A. G. MACKENZIE, secretary of the Utah chapter of the American Mining Congress, is back at Salt Lake headquarters after a tour through the Uintahs with Fred R. Beckdolt, of Carmel, Calif., writer and novelist.

CORNELIUS F. KELLEY, president of the Anaconda Copper Mining Co., is spending the summer at his summer home on Swan Lake, Mont. Recently he made several inspection trips to the properties of the company in Utah and Montana.

GEORGE C. CROSSLEY, mining engineer, and president of the United Clay Mines Corporation, Trenton, N. J., has sailed for England on business in connection with clay mines in Cornwall and Dorset. Mr. Crossley will visit on the Continent before returning in the fall.

THE HON. A. M. BADDELEY, Secretary of Mines and Minister of Labor for New South Wales, Australia, is traveling in Canada investigating mining operations and conditions in industry, and has secured much official information at Ottawa applicable to Australian conditions.

PROF. H. C. RICHARDS

H. C. RICHARDS, D.Sc., professor of geology and mineralogy in the University of Queensland, Australia, is an Australian by birth, having been born in Victoria, forty-two years ago. He is a graduate of the University of Melbourne, where he completed his honor course in March, 1907, and gained final honors in geology. In the same month he was appointed as a mill superintendent for the De Bavay Zinc Treatment Co. at Broken Hill, New South Wales. Fourteen months later, having won the Caroline Kay graduate research scholarship, he resigned the Broken Hill position to take up research work in the Melbourne University. In 1910 Professor Richards was appointed to take charge of the chemical, mining, and metallurgy department in the University of Queensland; in 1915 he gained the degree of doctor of science in geology, Melbourne University, for research work; and in 1919 was appointed professor of geology and mineralogy in the University of Queensland, a position which he still holds. Dr. Richards, among other distinctions, has been awarded the Felton Grimwade chemical research prize by the Melbourne University; has been dean of the faculty of science and president of the professional board, Queensland University, as well as president of the geological section of the Australian Association for the Advancement of Science, president of the Royal Society of Queensland, originator and chairman of the Great Barrier research committee, and member of the senate of the University of Queensland. He is also a member of the international committee on oceanology; of the Society of Economic Geologists of America; chairman of the Queensland committee of the Australian Commonwealth council for scientific and industrial research; member of the executive committee of the Australian national research council of the Royal Geographical Society of Australia, and of a newly created Queensland government advisory board connected with oil prospecting. Dr. Richards has published numerous papers in the proceedings of scientific societies.

GEORGE KLUG, of Messrs. Bewick Moreing & Co., London, who has been on a visit to Australia, sailed from Sydney on July 14 for San Francisco. He will visit important mining centers in the United States and also represent Australia at the Empire Mining and Metallurgical Congress to be held in Canada.

OBITUARY

ELBERT HENRY GARY, chairman and chief executive officer of the U. S. Steel Corporation, died suddenly in New York City on Aug. 15.

LUNSFORD P. YANDELL, president of the Mohawk Mining Co., official of many other corporations and sportsman, died recently in his sleep at his home in Greenwich, Conn.

J. SPRANGER HARRISON, a pioneer of the Rand, died recently on his farm at Bank, West Transvaal, at the age of seventy. Harrison St., in Johannesburg, was named after him in the early days.

E. E. CARPENTER, mining engineer and graduate of the mining department of the University of California, class of 1906, was killed in an automobile accident on July 13, 1927, in Alameda, Calif.

JOSEPH POPE, of Forbes' Reef, Swaziland, died recently at Johannesburg. He was at one time manager of the Africander Gold Mine, near Klerksdorp, and was on the engineering staff of the Farrar group of mines for several years.

DR. ALEXANDER CROMBIE HUMPHREYS, president emeritus of Stevens Institute of Techonology and one of the country's most eminent engineers, died on Aug. 14 at his summer home at Morristown, N. J. Dr. Humphreys was seventy-six years old. Among many other societies, he was a member of the A.I.M.E.

MAJOR MAURICE HEANY died recently at Bulawayo, Southern Rhodesia. He was a member of one of the oldest families in Virginia, U. S. A., and was an associate of Rhodes and Jameson, in the early days of Rhodesia, and he took the delaying message to Dr. Jameson, at the time of the "Raid." Major Heany became president of the Rhodesian Chamber of Mines and of the Rhodesian Pioneer Society.

JULES ST. PAUL, a prominent prospector and one of the pioneers of the Porcupine area, died recently at Timmins, Ont., from heart failure. He was born at Senegal, French Africa, and came to Canada when young. He arrived in Porcupine in 1909, and was a familiar figure in the mining camps of northern Ontario, and one of the largest claim holders. Mr. St. Paul was president of the United Explorers Corporation, and also of the Northern Prospectors Corporation. The Red Lake rush attracted him, and he was one of the first to stake in the Kamiskotia copper area. In addition to his mining activities Mr. St. Paul took a prominent part in municipal affairs.

Recent Technical Publications

THE GEOLOGY OF SOUTH AFRICA. By Du Toit. Illustrated with 39 plates, 64 text figures, and a geological map. Medium 8 vo. Pp. 476. Price £1 8s.; postage 1s. 2d. extra.

THIS valuable compendium is essentially a descriptive geology of the region covered, painstakingly prepared and well balanced. As such it is of inestimable value to the student of South African geology, whereas it has only a minor interest for the general student seeking new principles or penetrating discussion and weighing of principles already advanced. Yet even for the general student there is material of value, especially if this be followed up into the larger literature of the subject. As for special students of ore deposits, no disproportionate emphasis is laid upon this branch in the treaties, so that their gleanings will not be abundant.

The book is in thirteen chapters, following the system of describing the rocks of different ages in separate chapters, beginning with the oldest. Major geological time subdivisions, the author explains, as established in Europe and largely adopted in America and elsewhere, do not coincide with the same kind of time subdivisions in South Africa, so that it is difficult to classify the rocks under the established time designations; a difficulty which is enhanced by the scarcity of fossils. The author remarks (p. 11) "the 'diastrophic' periods in South Africa certainly do *not coincide* with those in Europe. Nearly every important break in South Africa, paleontological as well as stratigraphical, happens to fall somewhere within one of the European systems, and each more or less well-marked unconformity between the systems in the Northern Hemisphere is usually represented in this country by continuous deposition." Thus the great Karroo System of South Africa comprises part of the European Jurassic, the whole Triassic and Permian, and part of the Carboniferous: while the older Cape System comprises part of the Carboniferous, the whole Devonian, and part of the Silurian.

The earliest of the fossiliferous beds in South Africa, it is estimated, were deposited between 100 and 200 million years ago (p. 3).

The systematic descriptive geology is preceded by two chapters on "Geological Principles" and "Outline of Physical Geography and Geology"; and succeeded by four chapters on "Primitive Man," "The Soils of South Africa," "Economic Geology" (pp. 390-423), and "The Geological History of South Africa."

Directing the reader to the chapter on "Economic Geology," we find the author reminding us again of the economic importance of South Africa's minerals: the region produces most of the world's diamonds and half its gold; Rhodesia ranks second in the world in output of asbestos and chrome; the Union leads in corundum; and the annual tonnage of coal is "tremendous." Yet the region is largely unprospected. The bulk of the orebodies are magmatic (p. 391). Some are crystallized as segregations in basic igneous rocks—such ores as the chromites and nickeliferous pyrrhotites. In the acid magmas the sulphides and oxides collected "in the still liquid fraction and are hence found either in the late crystallizing pegmatites traversing the plutonic body, as pegmatites and quartz veins cutting the country rock, or as impregnations along or near the contact of the latter."

The principal period of "mineralization" accompanied the intrusion of the Old Granite and Gneiss (Primitive, or, as we say in America, Pre-Cambrian). These ores are mainly replacements, impregnations, or fissure veins. Directly ore-bearing magmas of this date are restricted "to the curious copper-bearing pegmatite of the Khan mine in South West Africa." The ore of this mine is a copper-bearing pegmatite, containing feldspar, quartz, pyroxene, sphene, and bornite: the bornite was the last mineral to crystallize. In this connection the copper ores of Namaqualand are highly interesting—they are dikes in gneiss, which dikes, while all closely related, vary from mica-diorite through norite to hypersthenite. They carry bornite, chalcopyrite, pyrrohotite, and magnetite, in several places sufficiently concentrated to be worth mining. The sulphides are magmatic, like the other minerals: they fill the spaces between the silicates, which are fresh and with sharp crystal boundaries. Ore to the value of £16,000,000 has been mined. This adds still another example to those cited by the reviewer in connection with the description of a similar ore, by Professor Colony in *E. & M. J.* of April 9, 1927. To this ancient period belong, also, the chief gold deposits; the placer origin of the "banket" gold is admitted (p. 406).

The second important period of mineralization accompanied the intrusion of a great basic igneous sheet and the succeeding Red Granite in the Bushweld region. Magmatic differentiation within the basic sheet gave rise to ores of platinum, nickel, copper, chromite, and gold. The Red Granite intrusion was responsible for ores of tin, tungsten, arsenic, molybdenum, bismuth, and copper. The great copper-lead deposits in the Otavi region are connected with a granite intrusion of around the same age.

Certain copper and lead ores, to the east of Pretoria, are of later age, as also are copper-nickel ores resulting from differentiation of the Karroo dolerite magma. Post-Karroo quartz lodes near Nylstroom carry platinum. Near the close of the Cretaceous the revival of magmatic activity led to the multitude of kimberlite pipes, in some of which the diamond is found.

The foregoing gives a hint of the great significance of South Africa to the science of metallogy.

Among the non-economic features the reader will be interested in the glacial history of the region. Glacial deposits occur repeatedly in the ancient record: the most striking being the Dwyke series of the Karroo System (see above) which is a "tillite" and attains a maximum thickness of 3,000 ft. (p. 206).

J. E. SPURR.

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METALLURGY. A General Treatise for the Use of Students in Engineering. By Henry Wysor, B.S., metallurgical engineer for the Bethlehem Steel Corporation. Formerly professor of metallurgy in Lafayette College. Third edition. Published by the Chemical Publishing Co., Easton, Pa. Price $6.

THE book opens with a review and passes on to the consideration of raw materials used in metallurgical operations. One chapter is devoted to furnaces, and the principles of heating, and temperature control are discussed. The author then proceeds to deal with iron and steel, to which he devotes the five chapters that follow. The remainder of the book is taken up with the metallurgy of copper, nickel, cobalt, lead, zinc, and noble metals, mercury, tin, and the light metals (aluminum, magnesium, and the alkaline earths), with a chapter on the so-called hard metals, manganese, silicon, chromium, tungsten, vanadium, and the rarer metals. The book concludes with five chapters devoted to the subjects of Alloys, Casting, Metal Working, Heat Treatment, and a review of the physical properties of metals. Professor Wysor's work is profusely illustrated, the illustrations being notably clear and easy to understand.

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THE NEW INTERNATIONAL YEAR BOOK, 1926. Edited by Herbert Treadwell Wade. Dodd Mead & Co., New York City. Price, $6.75.

THE twenty-fifth annual volume of this work gives a compendium of progress in various activities for the year 1926. As usual, the most important subjects are treated by experts and the whole forms an authoritative reference work to supplement an encyclopedia. The volume comprises 799 pages and is of a form similar to the previous annual issues of this publication.

FLOTATION—"Effect of Certain Chemicals on the Floatability of Galena, Sphalerite, and Pyrite" is the title of a 12-page monograph, published as Technical Paper No. 9, by the technical department of the American Cyanamid Co. Results of research are reported that may be of practical interest to operators of flotation plants. Phospho cresylic, xanthate, and T. & T. reagents are compared in a novel series of tests. Copies of this pamphlet may be obtained free by those interested, on application to the American Cyanamid Co., 535 Fifth Ave., New York City.

RECENT PATENTS

Rock-Drill Equipment

No. 1,627,744. May 10, 1927. E. B. Lear, Phillipsburg, N. J., assignor to Ingersoll-Rand Co., Jersey City, N. J.

No. 1,627,909. May 10, 1927. W. B. King, Miami, Ariz.

No. 1,632,400. June 10, 1927. G. H. Gilman, Belmont, Mass.

DRILL BIT GRINDER—No. 1,627,983, May 10, 1927. T. Maickel, Butte, Mont.

No. 1,636,605. July 19, 1927. Charles C. Hansen, assignor to Ingersoll-Rand Co., Jersey City, N. J.

New design of valve chest.

No. 1,636,632. July 19, 1927. Charles C. Hansen, assignor to Ingersoll-Rand Co., Jersey City, N. J.

No. 1,636,651. July 19, 1927. William A. Smith, assignor to Ingersoll-Rand Co., Jersey City, N. J.

No. 1,635,934. July 12, 1927. George H. Gilman, Belmont, Mass.

No. 1,632,921. July 21, 1927. Ernest Penberthy, Detroit, Mich., assignor to Chicago Pneumatic Tool Company, New York, N. Y.

No. 1,633,471. July 21, 1927. Lewis C. Bayles and Fred M. Slater, Easton, Pa., assignor to Ingersoll-Rand Company, Jersey City, N. J.

No. 1,633,551. July 21, 1927. Gustave M. Nell, Denver, Colo., assignor to the Denver Rock Drill Co., Denver, Colorado.

* * *

SEPARATOR—No. 1,627,550. May 10, 1927. F. Bachmann, New York City, assignor to The Dorr Co., N. Y. City.

An apparatus for separating solids from liquids.

ORE TREATMENTS — No. 1,627,582. May 10, 1927. J. T. Terry, Leadville, Colo., assignor of one-half to T. H. Sheridan, Chicago.

A process for treating ores in which a metal ammonium salt and an alkali-hyposulphite are used.

CONCENTRATION—No. 1,627,648. May 10, 1927. E. H. Johnson and A. H. Winterton, East Rand, Transvaal, South Africa.

A design for a rotating drum concentrator.

FLOTATION PROCESS — No. 1,632,419. June 14, 1927. T. R. Simpson, Johannesburg, Transvaal, South Africa, assignor to Minerals Separation North American Corporation, New York City.

A flotation process for concentration of metalliferous ores in which an organic sulph-hydric compound and an organic protective colloid substance are used.

FILTRATION OF SOLUTIONS. No. 1,633,621. June 28, 1927. Joseph Blumenfeld, London.

Process for clarifying solutions involving formation of colloids.

TREATMENT OF ZINC-BEARING ORES AND METALLURGICAL PRODUCTS. No. 1,634,100. June 29, 1927. William Gepp, Harry Hey, Gilbert Rigg, of Melbourne, and others.

A new metallurgical process for zinc.

FLOTATION SEPARATING PROCESS. No. 1,634,615. July 5, 1927. Everett Hall and George R. Sanders, Jr., Joplin, Mo. Assignors to the Southwestern Engineering Corporation, Los Angeles.

A flotation process employing a small quantity of oxalic acid.

MINERAL SEPARATOR. No. 1,634,898. July 5, 1927. George R. Delamater, Harrisburg, Pa.

Design for a concentrating appliance.

GRAVITY SEPARATOR FOR GARNET ORES. No. 1,635,111. July 5, 1927. Francis B. Burns, North River, New York. Design for a new type of jig.

METHOD AND APPARATUS FOR SEPARATING MINERALS OF DIFFERENT SPECIFIC GRAVITY. Reissue. No. 16,674. July 12, 1927. Thomas M. Chance, Philadelphia.

A concentrating appliance.

CAR-DOOR OPERATING MECHANISM. No. 1,635,177. July 12, 1927. George B. Dorey, Chicago, Ill. Assignor to Enterprise Railroad Equipment Co.

A door-opening device for use on dump cars.

WATER-COOLED ROOF FOR REVERBERATORY FURNACES. No. 1,635,818. July 12, 1927. Michael Corcoran, Anaconda, Mont.

A system of water pipes for cooling the roof of reverberatory furnaces.

WET FEED MIXER. No. 1,635,321. July 12. George F. Hinkley, Brookings, S. D. Design for a mixing tank.

POWER SHOVEL. No. 1,635,434. July 12. John D. Rauch, Lima, Ohio, assignor to the Ohio Steam Shovel Co.

New design for a power excavator.

CENTRIFUGAL IMPACT PULVERIZER. No. 1,635,453. July 12, 1927. Francis E. Agnew, assignor to Minerva A. Brotherton, Santa Barbara, Calif.

Design for a crushing machine.

REISSUE: APPARATUS FOR CONVEYING CALCINE FROM ROASTER FURNACES AND CHARGING SAME INTO REVERBERATORY FURNACES. No. 121,730. Original No. 1,549,141. Alexander Grant McGregor, Warren, Ariz. July 19, 1927.

A design for conveyance of hot products.

BALL OR TUBE MILL. No. 1,636,138. July 19, 1927. Wilhelm Koppen, Backum and Christian Pfeiffer, Nieubeckum, Germany.

A new design for a tube mill, using a preliminary grinding chamber, a fine grinding chamber, and an intermediate chamber.

A METHOD OF DREDGING. 1,636,205. July 19, 1927. Nathaniel A. Yuille, San Francisco.

A rotary cutter for suction dredge.

ROTARY RETORT. 1,636,270. July 19, 1927. Bernhard Young, Frankfort-on-Main, Germany.

A design for a cylindrical furnace.

SINKING SHAFTS AND BOREHOLES. No. 1,636,313. July 19, 1927. Wilhelm G. Minuth, Calle, Germany.

A sinking method.

PROCESS OF MINING INSOLUBLE BORON COMPOUNDS. Nos. 1,636,455 and 1,636,456. July 19, 1927. Henry Blumenberg, Jr., Moapa, Nev.

A process for mining calcium borates insoluble in water by the use of hot ammonium chloride.

BALL MILL. 1,636,585. July 19, 1927. William M. Barker, Canton, Ohio.

Design for a ball mill supported on one trunnion only.

APPARATUS FOR REVERSING AND CONTROLLING REGENERATIVE FURNACES. No. 1,635,934. July 12, 1927. George H. Islay, Worcester, Mass.

Design for gas and air reversal mechanism.

SCREEN-VIBRATING MECHANISM. No. 1,632,927. July 21, 1927. Edward Haskins Shackelford, Jr., Joplin, Mo., assignor to Hebbard Manufacturing Company, Joplin, Mo.

An eccentric and bumper mechanism attached to the screen frame.

METALLURGICAL PROCESS. No. 1,633,091. July 21, 1927. William E. Greenawalt, Denver, Colo.

A process of treating copper concentrate containing rare or precious metals comprising roasting the concentrate, leaching the roasted concentrate with a solvent for the copper, then, when the desired amount of copper has been extracted from the roasted concentrate, the smelting of residual copper and the rare or precious metals into a matte, heating the matte to dissociate copper and sulphur, subjecting the resulting crude copper containing the rare or precious metals to electrolysis to deposit the copper as the electrolytic metal, and recovering the rare or precious metals from the residual slime.

WOOD PRESERVATIVE. No. 1,633,095. July 21, 1927. Ralph Howard Handy, Berkeley, Calif.

A wood preservative consisting of a water-in-oil emulsion.

BELT CONVEYOR. No. 1,633,153. July 21, 1927. Charles S. Wray, Atlantic Highlands, N. J.

In an idler for belt conveyors, comprising several pulleys, means to move one of said pulleys angularly with respect to the course of the belt and the vertical plane of its transverse axis.

PULVERIZING MACHINE. No. 1,633,164. July 21, 1927. Warburton Kerr Cruickshank, Regina, Saskatchewan, Canada.

New grinding apparatus designed for heating the material during the crushing operation.

CONCENTRATOR TABLE. No. 1,633,199. July 21, 1927. Albert H. Stebbins, Los Angeles.

A design for a riffled deck table.

BLASTING CARTRIDGE. No. 1,632,887. July 21, 1927. John H. Crawford, Arthur W. Helmholtz, and Dent Ferrell, Harrisburg, Ill.

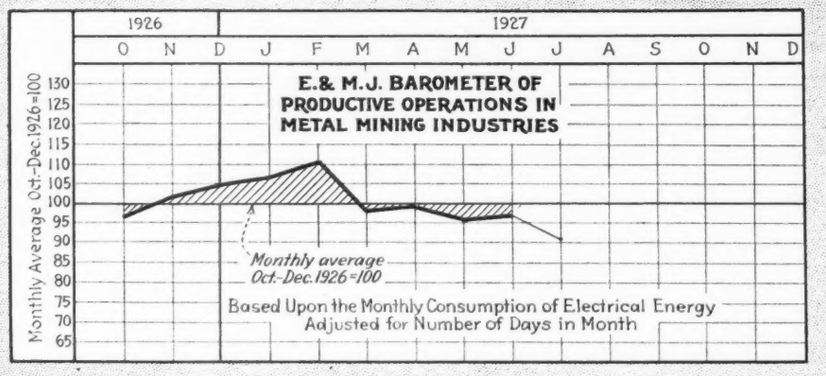
A detonator using liquid carbon dioxide.

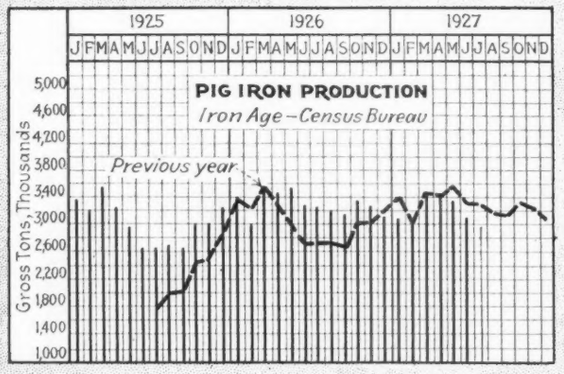
CLASSIFIER. No. 1,633,371. July 21, 1927. Harrison Streeter Coe, Lawrence, Kan.

A new form of classifier having a set of revolving arms fitted with scoops to carry solids to the discharge.

Indicators of Industrial Activity

of Significance to Mining


1926
1927
O N D J F M A M J J A S O N D
E.& M.J. BAROMETER OF PRODUCTIVE OPERATIONS IN METAL MINING INDUSTRIES
Monthly Average Oct.-Dec.1926=100
130 125 120 115 110 105 100 95 90 85 80 75 70 65
Monthly average Oct.-Dec.1926=100
Based Upon the Monthly Consumption of Electrical Energy Adjusted for Number of Days in Month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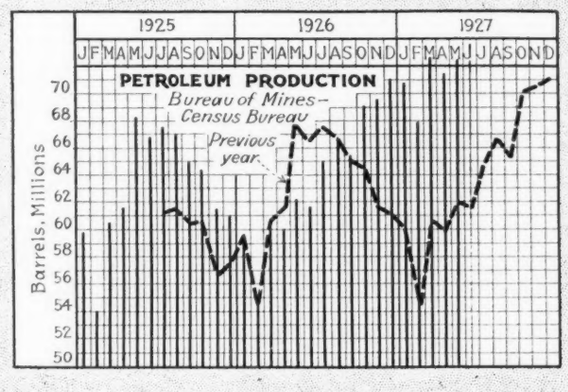
1926
1927
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
PIG IRON PRODUCTION
Iron Age—Census Bureau
Previous year
Gross Tons, Thousands
5,000 4,600 4,200 3,800 3,400 3,000 2,600 2,200 1,800 1,400 1,000


1925
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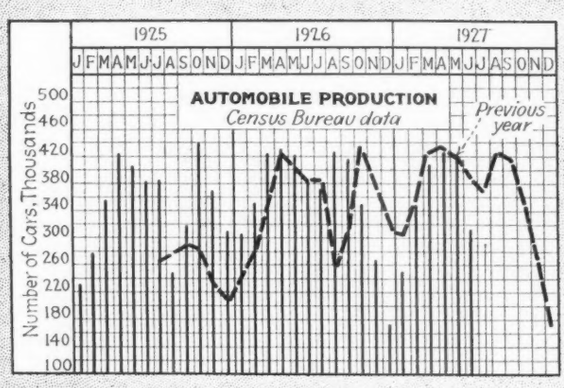
1927
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
PETROLEUM PRODUCTION
Bureau of Mines—Census Bureau
Previous year
Barrels, Millions
70 68 66 64 62 60 58 56 54 52 50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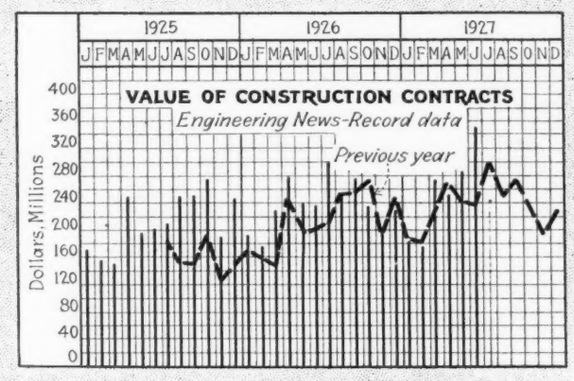
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
AUTOMOBILE PRODUCTION
Census Bureau data
Previous year
Number of Cars, Thousands
500 460 420 380 340 300 260 220 180 140 100


1925
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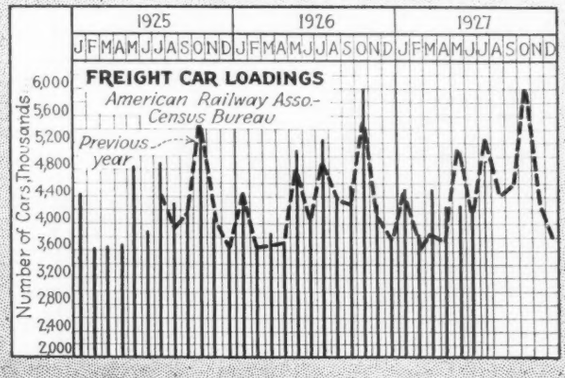
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
VALUE OF CONSTRUCTION CONTRACTS
Engineering News-Record data
Previous year
Dollars, Millions
400 360 320 280 240 200 160 120 80 40 0


1925
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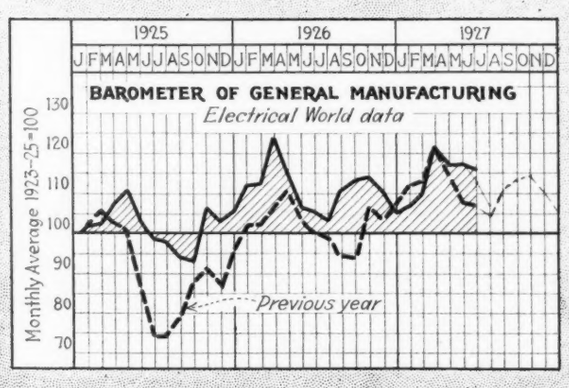
1927
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
FREIGHT CAR LOADINGS
American Railway Asso.-Census Bureau
Previous year
Number of Cars, Thousands
6,000 5,600 5,200 4,800 4,400 4,000 3,600 3,200 2,800 2,400 2,000


1925
1926
1927
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
BAROMETER OF GENERAL MANUFACTURING
Electrical World data
Monthly Average 1923-25=100
130 120 110 100 90 80 70
Previous year

MARKET AND FINANCIAL NEWS

Utah Copper Increases Profits Despite Lower Metal Prices

THE current report of the Utah Copper Co., covering the second quarter of the year, shows a total net production of copper from all sources and a comparison with the output for the first quarter as follows:

	Copper Produced Pounds	Monthly Production Average
Second Quarter	60,056,091	20,018,697
First Quarter	61,752,783	20,584,261

During the quarter the Arthur plant treated 1,777,700 dry tons of ore and the Magma plant 1,757,100 tons, a total for both plants of 3,534,800. Average grade of ore treated at the mills was 0.97 per cent copper and the average mill recovery of copper in the form of concentrates was 90.17 per cent of that contained in the ore, compared with 0.99 per cent and 87.64 per cent, respectively, for the previous quarter.

Average cost per pound of copper produced, including depreciation of plant and equipment and all fixed and general expenses, and after crediting gold, silver, and miscellaneous earnings, was 7.6c., compared with 7.9c. for the preceding quarter, computed on the same basis.

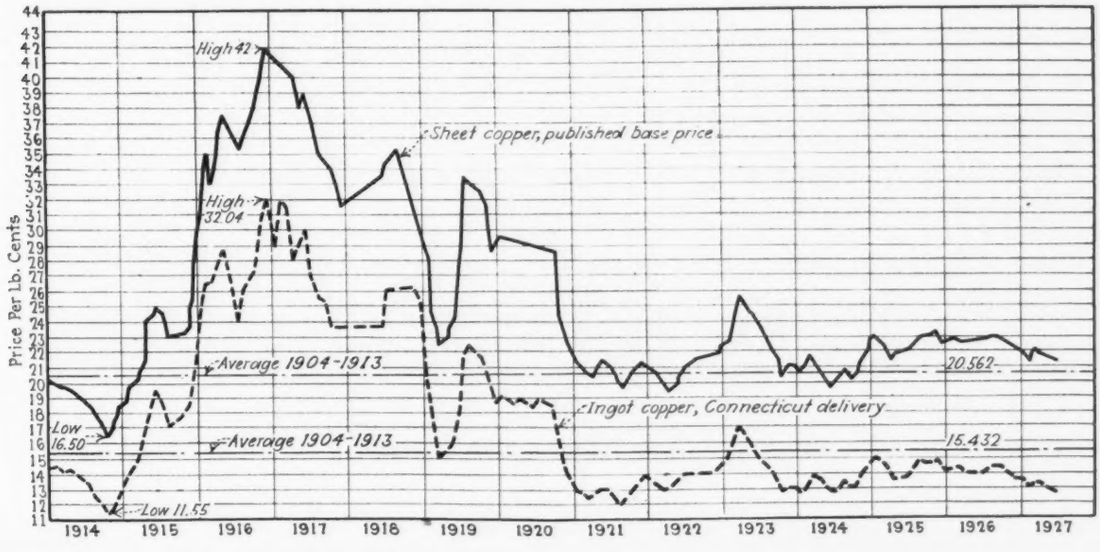
The following tabulation shows the financial results of the company's operations for the quarter as compared with the previous quarter:

	1927 Second Quarter	First Quarter
Net profit from copper production	$2,896,224	$2,749,516
Miscellaneous income, including gold and silver	591,203	723,420
Income from investments	857,631	531,118
Total income	$4,345,059	$4,004,055
Depreciation	313,391	311,701
To surplus	$4,031,667	$3,692,354

Comparative Prices of Sheet and Ingot Copper

THE accompanying chart, prepared by Raymond A. Dusault, New York manager for the Taunton-New Bedford Copper Co., of Taunton, Mass., gives an interesting comparison of the fluctuations in prices of raw copper and rolled copper products during recent years. The upper line shows the base price for sheet copper as published in the trade; the lower line is the Connecticut Valley price for electrolytic ingot copper. Though the lines parallel each other in general, close examination will show some irregularities. The spread in recent years, for example, has been greater than during the war period; and, on the other hand, less than the pre-war average by a considerable margin.

Fluctuations in the prices for ingot copper and copper sheets



STATISTICAL NOTES

UNITED VERDE EXTENSION reports output of copper for the second quarter of the year in tons as follows: April, 1,631; May, 2,051; June, 1,768.

CHIEF CONSOLIDATED MINING CO. reports total net operating profit of $143,882 for the first six months of the current year.

MAGMA COPPER CO. reports net earnings for the first quarter of 1927 as $369,372, based on a net sales price of 12.59c. per pound of copper.

TREADWELL YUKON CO. reports its milling operations for 1926 as follows:

	Tons	Silver, Ounce	Lead, Per Cent	Zinc Per Cent
Ore milled	44,097	38.19	3.60	3.75
Concentrate produced	2,867	584.	51.	9.

A net operating profit of $521,750 resulted from the company's various operations.

MIAMI COPPER in the first half year of 1927 more than earned its dividend despite low copper prices. Production for the period was 13,500 tons of copper, compared with 27,644 tons for 1926.

CALUMET AND HECLA'S net profits for the first six months of 1927 totaled $223,887 or almost double those of the same period in 1926.

PARK UTAH CONSOLIDATED in spite of lower prices for lead and zinc has earned 60 per cent of the dividend re-

quirement at the new rate of 80c. per share. Income account for the first six months of the current year follows:

Total income	$2,369,815
Expenses and ordinary taxes	1,316,400
Depreciation	55,869
Profit, before depletion and federal taxes	997,546
Dividends	837,400
Balance	$160,146

INTERNATIONAL NICKEL shows a profit of $2,802,630 as a result of operations during the first half of the current year as shown in the summarized financial statement as follows:

Earnings	$4,247,162
Other income	40,020
Total income	$4,287,182
Administration and general expense	$304,000
Reserved for federal and franchise taxes	$326,024
Net operating income	$3,657,158
Depreciation and depletion	$799,706
Orford works property expense	54,819
Profits	$2,802,633

GRANBY CONSOLIDATED increased income and production during the second quarter of 1927 as compared with the first three months of the year as shown by the quarterly report. The following is a summary of results:

	1927 Second Quarter	1927 First Quarter
Copper produced, pounds	14,800,127	13,563,591
Average monthly production, pounds	4,933,375	4,521,197
Average cost f.o.b. refinery, cents	9.153	10.374
Operating income	$503,933	$331,347
Miscellaneous earnings	$46,873	$28,849
Total income	$550,806	$360,198
Less bond interest	$37,214	$66,249
Net income	$513,591	$293,948

The outstanding feature of company's financial affairs is the reduction of bond indebtedness. The entire original issue of $2,500,000 of 7 per cent convertible debentures has been retired, leaving $757,000 6 per cent first-mortgage bonds due May 1, 1928, as the only funded charge against the property ahead of the stock.

ENGELS COPPER CO. reports a profit of $79,000 on operations for the first half of the current year. Gross operating profit was $79,281. The profit and loss statement is as follows:

Gross value of production	$862,546	
Less freight and smelting charges	$300,267	
		$562,279
Less operating expense		492,498
Earnings, net of operations		69,781
Other income		9,500
Operating profit before deduction for depletion, development and depreciation		$79,281

The costs during the first half as compared with the same period of 1926 are shown by the following table:

	Six Months to June 30 1927	1926
Cost per pound copper, cents	11.6397	11.7323
Cost per ton ore	$2.4340	$2.4811
Ore milled, tons	192,378	215,589
Average copper content, per cent	1.839	1.792
Copper produced, pounds	6,355,465	6,798,576
Average price received per pound copper, cents	12.7378	13.7665

Zinc Situation Looks Brighter to International Metal Service

The following review of the world zinc situation as of Aug. 1 is reported by the International Metal Service, Ltd., London.

THE opening days of July brought no relief from the fears of zinc producers which had marked the end of June, and, indeed, the downtrend continued until July shipment touched as low as £27 10s. At one time it did look as though better times were in store, and there was a slight recovery, but the June statistics were not at all favorable and prices slipped back again to the lowest. It was not until mid-month that the tide really turned, but since that time there has been a steady increase in confidence, and the final quotation for July shipment was £29 10s. a ton, which was the highest quotation for prompt shipment since May 11.

The causes for this reaction are not far to seek. We have for some time past maintained that zinc was priced at below its intrinsic worth, the chief causes for this state of affairs being overproduction in America, a slight let-up in the demands by rollers in Europe, which naturally caused apprehensions of increased offerings of slab zinc on the London market, and, lastly, but by no means least, the extraordinary sympathy between lead and zinc. As regards the first of these, apparently smelters in the United States have put their house in order, as evidenced by the much better showing made by the mid-July statistics. For ourselves, we have never looked upon a matter of one month's supply as an aggressive or top-heavy tonnage to have in stock, but it is certainly more than marketing interests have been accustomed to for some time, and the sooner it is reduced to, say, two weeks' requirements the better it will be for the strength of the market.

As a good part of the slump was due to the decline in the selling price in lead, so the reverse is true, and as the price of the last-named metal has appreciated on both sides of the Atlantic, so has the market for zinc hardened in sympathy.

The third cause for uneasiness also appears to have been exaggerated. It is true that rollers, especially in Germany, were not operating at the same capacity as at the beginning of this year and that in the border districts they were meeting with such keen competition from Belgium sheets that local reductions had to be made, but it has to be remembered that many of the German works increased their capacity during the last half of 1926 and the early months of 1927, and it is doubtful whether the total consumption was appreciably below that of a year ago. Apparently, the slight slackening in takings by rollers was only a seasonal matter, and with the revival of the building industry in Germany, rollers are once again busily occupied and the time required by them for delivery of new business is gradually extending again. Stocks of slab zinc in their hands are reported to be very light and a good demand would seem to be assured for some time to come.

Belgium appears to be in much the same state as a month ago, but she will also feel the benefit of the increased demand for sheets in Germany, even if her own domestic consumption does not also pick up, and there should be no fear of any aggressive selling from that quarter.

In Britain the galvanizing trade has struck a dull patch. Relying as it does on India for such a large proportion of its orders, the absence of that country for any length of time is severely felt, and Indian business has not been on the scale which British galvanizers have grown accustomed to look for during the last two months. This may still be remedied, as it is notoriously a case of either a feast or a famine as far as buying of galvanized sheets is concerned, but, until there is a much better influx of orders, home consumption is bound to be somewhat disappointing. British production of slab zinc during July is estimated to have been 4,600 long tons.

Though there are too many cross-currents to permit of any one taking a long view of the market at the moment, we must confess to being rather more optimistic as to the outlook for the next two or three months than we were when writing a month ago.

Our estimate of world stocks of zinc as at Aug. 1 is as follows:

Country	Metric Tons
United States	35,700
Canada	2,700
Australia (including afloat)	2,800
Germany-Poland	6,500
Belgium	3,500
France	1,600
Great Britain	1,700
Scandinavia	200
Far East	500
Elsewhere	1,500
Total	56,700

NEW JERSEY ZINC CO. has a surplus of $800,098 for the half year ending June 30, 1927, according to the abridged statement now in the hands of the shareholders. The following figures are abstracted from this statement:

Total income:		
For the first quarter		$1,769,480.30
For the second quarter		1,975,514.28
For the half year		$3,744,994.58
Deduct dividends declared:		
2% paid May 10, 1927	$981,632.00	
2% payable July 9, 1927	981,632.00	
2% payable Aug. 10, 1927	981,632.00	
		$2,944,896.00
Surplus for the half year ended June 30, 1927		$800,098.58

The Market Report

Metal Prices Weaken in Dull Markets Both Here and Abroad

New York, Aug. 17, 1927—Prices for all of the major non-ferrous metals are lower today than they were a week ago. The change in neither lead nor zinc is great; and although copper is quotationally off 17.5 points in the domestic market, it is significant that the sales were exceptionally small and the principal producers are uniformly out of the market. The impression prevails this afternoon that most of the cheaper metal has been taken up and that buyers will have to meet the higher prices of the larger sellers. Prices in London likewise are generally down.

Copper Market Mixed

Second-hands and custom smelters for the most part have done what little business was transacted in a very dull copper market this week. The larger selling agencies realized 13⅜c. in Connecticut last Thursday and 13.50c. at high freight-rate points as late as Saturday. Occasional sales have been made at 13.30 and 13.25c. Valley, since then. The total tonnage, however, was eclipsed by sales at lower figures. Buyers seem sadly indifferent, so that sellers who have done business have had to work hard, and to cut prices. The big producers argue that it is foolish to force the market, and are practicing what they preach. Today prices have been as high as 13.125c., Valley, and as low as 13.125c. in the so-called Middle West. The export price continues at 13.65c. c.i.f. The most encouraging feature in the statistics issued during the week was the unmistakable trend toward lower mine production in the United States. Porphyry, Lake, and Vein groups all show lower production. The net result is a decline of about 15 per cent over the rate of January and February of this year. On the other hand deliveries are somewhat lower than in June; and refined stocks have increased.

Daily Prices of Metals

Aug.	Copper	Tin		Lead		Zinc
	Electrolytic, N. Y.	99 Per Cent	Straits	N. Y.	St. L.	St. L.
11	13.025	64.00	64.75	6.75	6.40@6.50	6.35@6.40
12	13.025	64.00	64.625	6.75	6.375–6.475	6.40
13	13.00	63.625	64.375	6.75	6.375@6.40	6.375@6.40
15	12.925	63.50	64.375	6.75	6.375@6.40	6.375@6.40
16	12.875	63.375	64.25	6.65@6.75	6.35@6.40	6.35@6.375
17	12.875	63.125	63.75	6.65@6.75	6.35@6.40	6.35
	12.954	63.604	64.354	6.733	6.400	6.377

Average prices for calendar week ending Aug. 13, 1927, are: Copper, 13.029; 99 per cent tin, 64.063; Straits, 64.854; N. Y. lead, 6.750; St. Louis lead, 6.458; zinc, 6.367; and silver, 54.375.

The above quotations are our appraisal of the major markets for domestic consumption based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

Copper, lead, and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

In the trade, copper prices usually are quoted on a delivered basis; i.e., delivered at consumer's plant. As delivery and interest charges vary with the destination, the figures shown above are net prices at refineries on the Atlantic seaboard. Delivered prices in New England average 0.225c. per pound above those quoted, and prices at so-called Middle West destinations, 0.325c. above.

Quotations for copper are for ordinary forms of wire bars, ingot bars, and cakes. For ingots an extra 0.05c. per pound is charged and there the other extras for other shapes. Cathodes are sold at a discount of 0.125c. per pound.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York is now quoted at 0.35c. per pound above St. Louis, this being the freight rate between the two points.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

Aug.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
11	55⅝	55 15/16	62¾	296	287¾	23⅜	23 13/16	28 7/16	28 5/16
12	55⅝	55 15/16	62¾	296	287¾	23 3/16	23 11/16	28¼	28⅛
15	55 3/16	55½	62¾	293¼	285¼	23 1/16	23 7/16	27⅞	27 13/16
16	55¼	55 7/16	62¼	293½	285½	22 13/16	23 3/16	27 13/16	27 13/16
17	55 1/16	55⅜	62¼	291½	284½	22 15/16	23⅜	27⅞	27 13/16

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Aug.	Sterling Exchange "Checks"	Silver		Gold London	Aug.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
11	4.85½	54⅛	24 15/16	84s11½d	15	4.85½	54½	25⅛	84s11½d
12	4.85½	54½	25 1/16	84s11½d	16	4.85⅝	54½	25⅛	84s10½d
13	4.85½	54⅝	25 5/16	.....	17	4.85⅝	54⅝	25⅛	84s10¾d
					Avg.		54.479		

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-half cent premium.

Lead Declines in the West

Though no change has been made in the American Smelting & Refining Co.'s contract price for New York lead, which remains at 6.75c., the market is distinctly weaker. This tendency has manifested itself particularly in the West, where dealers and smaller producers have cut the prices asked by the leading interests. Yesterday and today one of the principal producers was firm at 6.40c., St. Louis, though other sellers were willing to accept orders at 6.35c., and in one direction, 6.30c. might have been done. In the East, though the usual contract lead went out at the Smelting company's price, September and October metal was available at from 5 to 10 points' concession, though the actual business done was not large. In fact, the lead market, like that for the other metals, has been exceedingly quiet all week. Statistics showing increased production in Mexico and Australia in July are offset by a surprising decline in the lead production of Burma.

Little Change in Zinc

As with the markets for the other metals, zinc has been quiet during the week, with only a slight easing in the price from 6.375 to 6.35c. Despite the fact that producers of concentrates in the Joplin district maintain that $44 per ton is the minimum price at which they can realize any profit, and the further fact that the price is still under that figure, output has been creeping up and is now around 14,000 tons per week. This is not calculated to help the market for slab zinc; but aside from this, the situation seems balanced. High-grade is quoted nominally at 8c. in the New York district.

Tin Reacts Again

Most of the activity in the tin market during the week has been between dealers, but there have been only one or two days when the total tonnage reached good proportions. The price has reacted somewhat, reaching 63¾c.

for prompt Straits today, but is still above the level reached last month. There is but little premium on prompt delivery over September. October is about ¼c. less than near-by, and November about ½c. less.

Silver Steady and Quiet

For the last week the silver market has been quiet and steady, China being the chief support of the market. India has shown little interest, as parities there have been considerably below New York prices.

Mexican Dollars (old Mexican pesos): Aug. 11th, 40⅝c.; 12th, 41c.; 13th, 41⅛c.; 15th and 16th, 41c.; 17th, 41⅛c.

Foreign Exchange Steady

Foreign exchanges have remained steady, only unimportant fluctuations having taken place. Closing cable quotations on Tuesday, Aug. 16, were: Francs, 3.92⅛c.; marks, 23.79c.; lire, 5.44¾c. Canadian dollars, 5/64 per cent discount.

Other Metals

Quotations cover large wholesale lots unless otherwise specified. London prices are according to latest mail advices.

ALUMINUM—Per lb. 98 or 99 per cent grade, price of leading interest, 26c.; outside market, 25.30@25.80c.

ANTIMONY—Per lb., duty paid. New York: Chinese brands, range for the week, spot business, 11¾@11½c. September arrivals ⅛c. higher. Market quiet. Cookson's "C" grade, spot, 17¾c. Needle antimony nominally 8c. for lump and 10c. for powdered. White oxide, 16½c.

BISMUTH—Per lb., New York, in ton lots, $1.85@$2.10. London, 8s.

CADMIUM—Per lb., New York, 60c.

IRIDIUM—Per oz., $107@$110 for 98 @99 per cent sponge and powder.

NICKEL—Per lb. ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent grade) for single lots of spot metal.

PALLADIUM—Per oz., $53@$55. Small lots bring up to $58. Pure metal as a constituent of crude platinum, nominal.

PLATINUM—Official price quoted by the leading interest on small miscellaneous orders for refined metal, per oz., $72. Dealers and refiners quote the trade for refined metal, per oz., cash, $64@$65.50. Market dull and narrow. Pure metal as a constituent of crude platinum, at $62. Continues very dull.

QUICKSILVER—Per 76-lb. flask, range for week $118½@119½, nominal. Market shows little life. San Francisco wires $121.33. London, £20¾@£22.

The prices of Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Monel Metal, Osmium, Radium, Rhodium, Ruthenium, Selenium, Tellurium, Thallium, Tungsten, and Zirconium are unchanged from the issue of Aug. 6.

Metallic Ores

MANGANESE ORE—Per long ton unit of Mn. c.i.f. North Atlantic ports, minimum 47 per cent Mn, 36@38c. Caucasian, washed, 53@55 per cent, 40c. Chemical grades unchanged from quotations in the Aug. 6 issue.

TUNGSTEN ORE—Per unit of WO_3, N. Y.: Wolframite, $10.25@$10.50. Western scheelite, $10.75@$11. Market dull and prices largely nominal.

Chrome, Iron, Molybdenum, Tantalum, Titanium, Uranium, and Vanadium Ores are unchanged from quotations in the Aug. 6 issue.

Lead Again Advances—Zinc Unchanged

Joplin, Mo., Aug. 13, 1927

Blende	Per Ton
High	$45.10
Premium blende, basis 60 per cent zinc	$44.00@ 45.00
Prime Western, basis 60 per cent zinc	43.00
Fines and slimes, 60 per cent zinc	40.00@ 42.00
Average settling price, all zinc	41.19

Galena	
High	$88.90
Basis 80 per cent lead	$87.50@ 90.00
Average settling price, all lead	85.11

Shipments for the week: Blende, 14,082; lead, 1,380 tons. Value, all ores the week, $697,510.

Buyers would offer no more than $43, basis, for Prime Western grades of zinc concentrate this week, and many sellers would not accept this offering, the purchase being lowered to 12,040 tons. Production and shipment were nearly balanced, with less than 1,000 tons increase in bin stocks.

At least 1,000 tons of lead loaded this week was settled for on a basis price of $90, though quotations are announced by buyers at $87.50 basis. Reserve stocks of lead are only nominal, and all are held by a few companies.

Platteville, Wis., Aug. 13, 1927

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$45.75

Lead Ore	
Lead, basis 80 per cent lead	$85.00

Shipments for the week: Blende, 1,640 tons; lead, 40 tons. Shipments for the year: Blende, 41,816; lead, 1,090 tons. Shipments for the week to separating plants, 2,669 tons blende.

Non-Metallic Minerals

Amblygonite, Asbestos, Barytes, Bauxite, Borax, Celestite, Chalk, China Clay, Diatomite, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Iron Oxide, Lepidolite, Limestone, Magnesite, Mica, Monazite, Ocher, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystal, Silica, Spodumene, Sulphur, Talc, Tripoli, and Zircon are unchanged from prices in the Aug. 6 issue.

Mineral Products

ARSENIOUS OXIDE (White Arsenic)—Per lb., 4c. Fair buying. London, Cornish white, per long ton, £16½@£16¾.

Calcium Molybdate, Copper Sulphate, Sodium Sulphate (Salt Cake), Sodium Nitrate, and Zinc Oxide are unchanged from prices in the Aug. 6 issue.

Ferro-Alloys

FERROCHROME—Per lb. of contained chromium, 60@70 per cent chromium, 4@6 per cent carbon, 11@11½c.

FERROMANGANESE—Per long ton, domestic and foreign, 78@82 per cent, $90, furnace, for delivery during second half 1927. Spiegeleisen, 19@21 per cent, $33@$34 f.o.b. furnace.

FERROTUNGSTEN—Per lb. of W contained, 75@80 per cent, 96@98c. f.o.b. works. Dull.

Ferrocerium, Ferrophosphorus, Ferrosilicon, Ferrotitanium, Ferro-uranium and Ferrovanadium are unchanged from prices in the Aug. 6 issue.

Metal Products

ROLLED COPPER—Per lb., f.o.b. mill, sheets, 22c.; wire, 15¼c.

LEAD SHEETS—Per lb. full rolled, 10½c.; clipped, 10½c.

NICKEL SILVER—Per lb., 28¾c. for 18 per cent nickel Grade A sheets.

YELLOW (MUNTZ) METAL—Per lb., dimension sheets, 19¼c.; rods, 16¼c.

ZINC SHEETS—Per lb., f.o.b. mill, 10c.

Refractories

Chrome Brick, Fireclay Brick, Magnesite Brick, Silica Brick and Zirkite are unchanged from quotations in the Aug. 6 issue.

Steel Industry Not Improving in August

Pittsburgh, Aug. 16, 1927

Steel ingot production in July was about 3,200,000 tons, or some 5 per cent above the common trade estimate, and indicating an operation of about 68 per cent of full capacity. This month there is scarcely any increase over July, though last year and year before there was a 10 per cent increase. July and August combined run about 14 per cent below those months of last year.

In general the steel consuming industries are running somewhat slack and the automobile industry continues failing to have its predicted pick-up. The totals of steel demand will probably run higher for the last four months of the year than the present rate, but the year's total will probably be 5 per cent or more under that of 1926, which was record high, passing 1925 by 6 per cent. Finished steel prices continue to hold very steadily, there being no disposition to shade.

Pig Iron—The Valley market continues dull. Prices have slipped 25c. in basic and 50c. in foundry on relatively insignificant transactions. Bessemer, $18.50; basic, $17.25; foundry, $17.50, f.o.b. Valley furnaces.

Connellsville Coke—Furnace coke is firmer, at $3@$3.25, foundry remaining $4@$4.75.

Mining Stocks—Week Ended Aug. 13, 1927

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Anaconda	New York	47	45¼	45⅜	Jy.16, Au.22 Q	0.75
Arcadian Consol.	Boston	*35	*25	*25		
Ariz. Com'l	Boston	6⅜	6¼	6¼	Jy. 18, Jy. 30	0.25
Calaveras	N. Y. Curb			1⅜		
Calumet & Arizona	New York	70⅜	68⅜	70	Ju. 13, Ju. 20 Q	1.50
Calumet & Hecla	Boston	16⅜	16	16	Au. 31, Se.15 Q	0.50
Cerro de Pasco	New York	65	62¼	63	Jy.14, Au.1 Q	1.00
Chile Copper	New York	36⅜	35¼	35⅜	Se. 2, Se. 30, Q	0.62½
Con. Coppermines	N. Y. Curb	2⅜	2⅜	2⅜		
Copper Range	Boston	14½	13¼	13½	Ap.2, My.2, A	1.00
Crystal Copper	BostonCurb			*48		
East Butte	Boston	1⅜	1⅜	1⅜	Dec., 1919	0.50
Granby Consol	New York	40¼	38¼	38½	Jn.15 Jy. 1 Q	1.00
Greene Cananea	New York	63¾	55	58	Nov., 1920	0.50
Howe Sound	New York	41½	38½	39⅜	Apr.1,Apr.15 Q	1.00
Inspiration Consol	New York	22¼	18⅜	19⅜	Ma.17, Ap.4, Q	0.25
Iron Cap	Boston Curb			1⅜		
Isle Royale	Boston	10¼	10	10	Fe.4, Fe.19, Q	0.50
Kennecott	New York	67⅜	65⅜	66¼	Ju. 3, Jy. 1 Q	1.25
Magma Copper	New York	37	35½	35½	Jn.30, Jy.15, Q	0.75
Mason Valley	N. Y. Curb	*85	*80	*80		
Miami Copper	New York	15¼	15	15	Au.1, Au.15 Q	0.37½
Mohawk	Boston	43	40	42	Jy.30, Se.1 Q	1.00
Mother Lode Coal	New York	3	2⅜	2⅜	Jn.10, Jn.30	0.25
Nevada Consol	New York	14⅝	14¼	14⅜	Jn. 3, Jn. 7 Q	0.37½
New Cornelia	Boston	21¼	21⅛	12⅜	Au.5, Au.22 Q	0.50
Noranda	N. Y. Curb	22⅜	21½	22¼		
North Butte	Boston	1	*90	*90	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	1 7/16	1¼	1¼	Sept. 1926	0.03
Old Dominion	Boston			13¾	Dec., 1918	1.00
Phelps Dodge	N. Y. Curb	116	116	116	Jn.18, Jy.1 Q	1.50
Quincy	Boston	16½	15	15	March, 1920	1.00
Ray Consolidated	New York	15	15	15	Ap.20, Ap. 30	0.25
St. Mary's Min. Ld.	Boston	22	21	21	Fe.10, Ma.10	2.00
Seneca Copper	New York	1⅛	1⅛	1⅛		
Shattuck Denn	Boston Curb			5⅜		
Tenn. C. & C	New York	9⅛	8⅛	8⅛	Au.31,Se.15, Q	0.12½
United Verde Ex	N. Y. Curb	24	23¼	24	Jy.6, Au.1 Q	0.75
Utah Copper	New York			119½	Jn. 17, Jn. 30 Q	1.50
Utah Metal & T	Boston	1⅛	1⅛	1⅛	Dec., 1917	0.30
Walker Mining	Salt Lake	*60	*58	*60		
NICKEL-COPPER						
Internat. Nickel	New York	67⅞	61¼	65⅜	Jn. 16, Jn. 30 Q	0.50
Internat. Nickel pfd.	New York			109	Ap. 14, My. 2 Q	1.50
LEAD						
Gladstone Mtn	Spokane	*20	*19½	*19½	June, 1927	0.005
National Lead	New York	111½	107	108	Se. 16, Se. 30 Q	1.25
National Lead pfd	New York	132	132	132	Se.1, Se. 30 Q	1.75
St. Joseph Lead	New York	41⅛	40⅞	41⅛	Se.10,Se.20, QX	0.75
ZINC						
Am. Z. L. & S	New York			7	May, 1917	1.00
Am. Z. L. & S. pfd.	New York	42¼	41	42	Nov., 1920	1.50
Butte C. & Z	New York	4⅛	4	4⅛	De. 9, De. 24	0.50
Butte & Superior	New York	9⅛	8⅞	9	Jn. 17, Jn. 30 Q	0.50
Callahan Zn-Ld	New York	1⅜	1⅛	1⅛	Dec., 1920	0.50
Consol.Lead&Zinc'A'	St. Louis	12⅜	12	12	Ma.15, Ap.1 Q	0.25
Eagle-Picher	Cincinnati	27	26⅞	27	Au.15, Se.1 Q	0.40
Eagle-Picher pfd	Cincinnati			116	Jn.30, Oc.15 Q	1.50
New Jersey Zn	N. Y. Curb	185	184	185	Jy.20,Au.10 QX	2.00
United Zinc	N. Y. Curb			*55		
Yellow Pine	Los Angeles	*36½	*35	*35	Dec. 1925 Q	0.04
GOLD						
Alaska Juneau	New York	1⅜	1⅛	1⅛		
Argonaut	Toronto	*34	*31½	*32		
Barry-Hollinger	Toronto	*32½	*29½	*32½		
Consol W. Dome L.	New Toronto	10½	10	10		
Cresson Consol. G	N. Y. Curb	2¼	2 3/16	2¼	Ma.31,Ap.10 Q	0.10
Dome Mines	New York	7¼	7	7⅛	Jn.30, Jy. 20 Q	0.25
Golden Cycle	Colo.Springs			1.69	Au.30, Se.10 Q	0.04
Hollinger Consol	Toronto	18.35	17.85	17.85	Jn. 27, Au. 12 Q	0.10
Homestake Mining	New York	61¾	61⅛	61⅛	Au.21, Au. 25 M	0.50
Kirkland Lake	Toronto	1.76	1.52	1.75		
Lake Shore	Toronto	20.85	20.40	20.76	Jn.1, Jn.1 X	0.20
McIntyre-Porcupine	New York	25¾	25¼	25⅜	Au 1, Se.1 Q	0.25
Portland	Colo.Springs			30	Ap.6, Ap.15, Q	0.02
Rand Mines	New York			45⅛	Au.23-30 Am.Sh.	1.52
Teck-Hughes	Toronto	8.80	8.35	8.74	Jy.21, Au.1	0.10
Tom Reed	Los Angeles			*45	Dec., 1926	0.02
Tough-Oakes	Toronto	*28	*25½	*27		
United Eastern	N. Y. Curb			*44	July, 1924	0.05
Vipond Cons	Toronto	*71	*57	*58	Apr.1, Apr.15	0.03
Wright-Hargreaves	Toronto	6.08	6.00	6.04	Jy.15, Au.1	0.05
GOLD AND SILVER						
Carnegie Metals	Pittsburgh	*13¾	*13	*13½		
Con. Cortez	N. Y. Curb	*19	*19	*19		
Con. Virginia	San Francisco	*2½	*2½	*2½		
Dolores Esperanza	N. Y. Curb			*50	July, 1923	0.05
Premier Gold	N. Y. Curb	2¼	2 3/16	2 3/16	Jn.14, Jy. 5	0.08
Tonopah Belmont	N. Y. Curb			1¼	Ma.15, Ap.4	0.08
Tonopah Extension	N. Y. Curb			*51	Apr. 1925	0.05
Tonopah Mining	N. Y. Curb	2⅛	2⅛	2⅛	Ma.31, Apr.21	0.07½
West End Consol	N. Y. Curb			*7	Mar., 1923	0.05
Yukon Gold	N. Y. Curb			*45	June, 1918	0.02
SILVER						
Beaver Consol	Toronto	1.34	1.19	1.34	May, 1920	0.03
Castle-Trethewey	Toronto	*75½	*75	*75½		
Coniagas	Toronto	4.95	4.85	4.90	May, 1924	0.12½
Keeley	Toronto	1.00	*95	*95	Se.1, Se.15	0.08
Lorrain Trout Lake	Toronto			*55	July, 1925	0.05
McKinley-Dar.-Sav.	Toronto	*15½	*15	*15½	Oct., 1920	0.03
Mining Corp. Can	Toronto	3.10	3.00	3.03	Jn. 29, Jy.15	0.12½
Nipissing	N. Y. Curb	5⅛	5⅛	5⅛	Jn.30, Jy.20	0.07½

Stock	Exch.	High	Low	Last		Last Div
SILVER-LEAD						
Ahumada	New York	3⅛	3⅛	3⅜	Ma. 25,Ap.4,QX	0.12½
Bingham Mines	Boston	49	47⅜	48	Jn.27, Jy. 5 Q	1.00
BunkerHill&Sullivan	N. Y. Curb	104	101	102	Jy. 30, Au.4 X	0.75
Cardiff M. & M	Salt Lake			*41	Feb. 5, 1927	0.10
Chief Consol	Salt Lake	2.70	2.65	2.65	Nov., 1926 Q	0.10
Consti'nMng.&Mill'g	Spokane	*28	*23	*23		
Erupcion	Boston Curb	1	*85	*90	Jn. 25, Jy. 5 Q	0.07½
Eureka Lily	Salt Lake	1.40	1.30	1.35		
Federal M. & S	New York	1.50	1.50	1.50	Jn.25, Jn.29 Spec.	$10
Federal M. & S. pfd.	New York	95	94½	94½	My.25, Ju.15 Q	1.75
Hecla Mining	N. Y. Curb	16	15⅝	16	My.4, Ju. 15 Q	0.25
Highland-Surprise	Spokane	*12	*11	*12		
Iron King Mining	Salt Lake	*52	*51	*52		
Keystone Mining	Salt Lake	†*27	†*15		Au. 12, Au. 26	0.07½
Lucky Jim	Spokane	*18½	*18½	*18½		
Lucky Tiger-Com	Kansas City	†7.10	†6.80		Au.4, Au.20	0.05
Mammoth Mining	Salt Lake	1.80	1.70	1.80	Jn.10, Jn.20 Q	0.05
Marsh Mines	Spokane	1.00	*87½	*87½		
North Lily	Salt Lake	4.00	3.75	4.00		
Park Utah	New York	7	6¾	6¾	Jn. 25, Jy. 1 Q	0.20
Plutus Mining	Salt Lake	1.85	1.85	1.85	Jy. 10, Jy. 15 Q	0.10
San Rafael	San Francisco			*24		
Silver King Coal	Salt Lake	8.95	8.40	8.95	Jn. 20, Jy. 1 Q	0.25
Silversmith	Spokane	*29	*26	*26	Oct., 1926 Q	0.02
Strattons Mines	Spokane	*50	*47	*47		
Sunshine M. Co.	Spokane	1.75	1.25	1.25		
Tamarack-Custer	Spokane	*27	*25½	*25½	Sept., 1924	0.25
Tintic Standard	Salt Lake	14.00	13.75	13.75	Jn.15, Jn.28	0.40
Utah-Apex	Boston	5⅛	5⅛	5⅛	Oct., 1926	0.25
IRON						
Bethlehem Steel	New York	62⅜	57⅛	60⅜	Se. 2, Oc. 1.	1.75
Cleveland-Cliffs Iron	Cleveland	110	95	105	Jy. 15, Jy. 25 Q	1.00
Colorado Fuel & Iron	New York	84	74⅜	76	May, 1921	0.75
Gt. North'n Iron Ore	New York	95½	92¼	94½	Dec. 6, Dec. 28	0.75
Inland Steel	New York	54½	51	51⅛	Au. 15, Se. 1 Q	0.62½
Replogle Steel	New York			12⅜		
Republic I. & S	New York	70⅛	66	66⅜	Au. 15, Se. 1 Q	1.00
Republic I. & S. pfd.	New York	104¼	104¼	104⅜	Se. 15, Oc. 1 Q	1.75
Sloss-Sheffield S. & I.	New York	120	120	120	Jn. 10, Ju. 20 Q	1.50
Sloss-Shef. S.&I. pfd.	New York			107½	Jn. 20, Jy. 1 Q	1.75
U. S. Steel	New York	134⅛	129½	131⅛	Au. 30, Se. 29 Q	1.75
U. S. Steel, pfd.	New York	133⅛	133	133½	Au.1, Au. 30 Q	1.75
Virginia I. C. & C	New York			40	Jan., 1924	1.50
Virginia I.C.&C. pfd.	New York			60½	Ju. 15, Jy. 1	2.50
DIAMONDS, PLATINUM, ALUMINUM, VANADIUM, TIN						
De Beers Consol	New York			27½	Jn. 26, Jn.30	1.45
So. Am. G. & P. New.	N. Y. Curb	2⅜	2⅛	2⅜		
Alum. Co. of Amer	N. Y. Curb	90⅛	86	87		
Alum. Co. ofAmer.pf.	N. Y. Curb	104	103⅞	103⅞	Jn. 15, Jy. 1 Q	1.50
Vanadium Corp.	New York	54⅛	48⅛	54⅛	Au. 1, Au. 15 Q	0.75
Patino M. & E.	New York	21⅛	21	21	Ap. 27, My. 5	1 sh.
ASBESTOS						
Asbestos Corp.	Montreal	24	23⅛	23⅜	Jan., 1926	1.50½
Asbestos Corp. pfd.	Montreal	92	88	88	Jn.30, Jy.15 Q	1.75
SULPHUR						
Freeport, Texas	New York	76⅜	68	71⅛	Jy. 15, Au.1 QX	1.25
Texas Gulf	New York	67⅛	63⅛	64⅛	Ju. 1, Ju. 15 Q	1.00
MINING, SMELTING, REFINING AND GENERAL						
Amer. Metal	New York	45⅛	43	43	Au.20, Se.1 Q	0.75
Amer. Metal, pfd.	New York			111½	Au.22, Se.1 Q	1.75
Amer. Sm. & Ref.	New York	166⅞	159⅛	161⅛	Jn.8, Au. 1 Q	2.00
Amer. Sm. & Ref. pfd.	New York	127⅛	127⅛	127⅛	Au. 1, Se. 1 Q	1.75
Consol. M. & S	Montreal	226½	225	226	Jn. 30, Jy. 15 X	6.25
Newmont Mining	N. Y. Curb	88⅛	86	86	Jn.30, Jy.15 Q	1.00
U. S. Sm. R. & M	New York	44	38	40⅛	Jy. 6, Jy. 15 Q	0.87½
U.S. Sm. R.&M. pfd.	New York	50	49⅛	50	Jy. 6, Jy. 15 Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. F, four weeks. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, J. A. Hogle & Co.; Colorado Springs, Colo., Henry Sachs.

LONDON QUOTATIONS—WEEK ENDED JULY 30, 1927

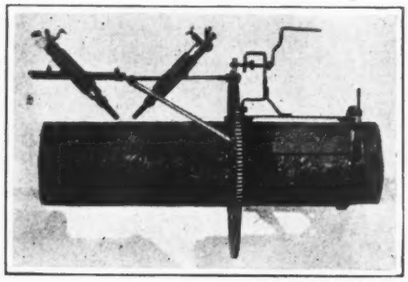
Name	High	Low	Last	Date	Last Div. Amount
Aramayo Mines (25 frs.)	81/3	77/6	80/—	Aug., 1927	5 p.c. (†)
British Platinum (£1)	2/—	1/6	2/—	Feb., 1925	2½ p.c.
Burma Corpn. (10 rupees)	14/1½	13/7½	13/10½	Aug., 1927	6 annas*
Bwana M'Kubwa (5s)	5/6	5/—	5/—		
Camp Bird (2s)	4/6	4/—	4/—		
El Oro (£1)	3/9	3/4½	3/6	Nov., 1924	2½ p.c.*
Esperanza (10s)	—/2½	—/2½	—/2½		
Frontino & Bolivia (£1)	14/6	14/3	14/3	July, 1927	5 p.c.
Mexican Corpn. (£1)	9/3	8/6	9/3		
Mexico Mines of El Oro (£1)	16/3	15/—	16/3	Dec., 1926	3¾ p.c.*
N'Changa Copper Mining	11/10½	9/—	9/6		
Oroville Dredging (£1)	5/1½	4/4½	5/1	Dec., 1923	3¾ p.c.
Ouro Preto (£1)	3/—	2/6	3/—	May, 1925	2½ p.c.
Rhodesian Congo Border (£1)	48/9	43/9	45/—		
St. John del Rey (£1)	11/—	10/9	11/—	May, 1927	3½ p.c.
San Francisco Mines (10s)	28/—	27/—	27/9	July, 1927	15s.
Santa Gertrudis (£1)	17/3	16/4½	17/—	July, 1927	7½ p.c.
Selukwe (2s. 6d.)	8/9	8/3	8/6	April, 1917	6¼ p.c.
S. Amer. Copper (2s.)	3/—	2/9	2/9	Nov., 1917	75 p.c.
Tanganyika (£1)	62/9	47/6	52/6	Aug., 1926	7½ p.c.
Union Miniere du Haut-Katanga (Brussels)	10.150	9.875	9.960	July, 1927	182.60 (‡)

* Free of British income tax. † Swiss francs and plus 15 p. c. bonus. ‡ Belgian frs. and free of taxation.

Modern Equipment

Machine Facilitates Salvage of Pipe Lines

EVERY YEAR it becomes necessary to discard or relocate many miles of existing pipe lines. Since a considerable investment is represented in the pipe, the question of salvage is important. The quickest method of realizing on this investment must be considered, and also the method which will retain the greatest value in the used pipe. A pipe-cutting machine has recently been devised and patented by N. E. Wagner, welding superintendent of the Prairie Pipe Line Co., Tulsa, Okla., which greatly facilitates the salvage of such pipe.



Pipe-cutting machine devised to facilitate removal or relocation of pipe lines.

To be entirely practicable, such a machine must be light, so that it can readily be carried from cut to cut along the line. It should also be adaptable to several sizes of pipe. It should be compact, to reduce the amount of bell-hole digging. It should be simple in construction, yet rugged, to work satisfactorily under all conditions of service, and should perform the work at a cost favorably comparable to other methods.

Essentially the Wagner pipe-cutting machine consists of two gears and a framework so arranged that two Oxweld oxy-acetylene cutting blowpipes are carried around the circumference of the pipe during the operation. The construction is extremely simple and is clearly shown in the illustration. When the crank handle is turned, the action of the gears causes the carriage supporting the two blowpipes to revolve about the pipe.

The blowpipes may be adjusted to any angle of cut desired, although 45 deg. is usual. Distance between the cuts may be varied within reasonable limits. Special Oxweld cutting blowpipes used provide a compact unit which eliminates much extra bell-hole digging. By using different sized internal shoes, the machine may be employed on different sizes of pipe. Thus a machine may be used on 4-in., 6-in., and 8-in. pipe merely by changing the internal shoe. Another machine of a larger size may be used on 10-in., 12-in., and 14-in. pipe.

The Wagner pipe-cutting machine is now being marketed by Oxweld Acetylene Co., 30 East 42d St., New York, N. Y.

Mercury as a Source of Power

INSTALLATION of a second unit of the Emmet mercury boiler and turbine at Hartford, Conn., and the satisfactory operating records of the first unit, would appear to give a fair measure of assurance that this type of equipment will operate economically, reliably, and with the flexibility necessary in central-station work, according to the *Industrial Bulletin* of Arthur D. Little, Inc. The technical suitability at least has been amply demonstrated.

The Emmet unit generates one-third of its power with mercury and two-thirds with steam, and the mercury portion requires a charge of about 15 lb. mercury per kilowatt capacity. Normally, the increase each year in generator capacity in this country is about two million kilowatts. If the mercury system were generally adopted this would call for 670,000 kw. of mercury turbines, requiring 10,600,000 lb. of mercury.

The possible adoption of mercury as a source of power is of considerable interest to the mining world in view of the fact that the present annual consumption of quicksilver in this country is about 2,000,000 lb., of which some 1,500,000 lb. is imported. The writer in *Industrial Bulletin* states that should the price of mercury advance to $150 a flask, the probable increase in production and decrease in other uses would set free about 25,000 flasks (1,879,000 lb.) for power-generation purposes. Thus, although the mercury turbine may fill an important place in power production it can never entirely replace steam units, on account of the limited supply of mercury.

It would hardly seem possible that even a price of $150 per flask would stimulate demand enough to provide all the mercury that, according to the above figures, is required for power-production purposes. The development of this type of turbine thus opens up a new field for chemical developments in finding a substitute for mercury—first, in the many fields in which mercury is now used; and second, in the field of substitutes for mercury in the high-temperature turbine itself. Somewhere between the extreme of very high-pressure steam requiring heavy equipment and difficult to handle, and of mercury, which although technically ideal, is expensive and limited in supply, there may be found a chemical which will prove satisfactory for use in the operation of high-temperature turbines.

Mine Locomotive Sales Indicate Increasing Use

Shipments of mining and industrial locomotives for the six months ended June 30, 1927, as reported to the Department of Commerce by ten firms, totaled 516. Of these 481 were mining locomotives, comprising 355 of the trolley type and 126 of the storage-battery type. The annual totals of such sales from 1922 to date are given in the accompanying table.

Mining Locomotives

	Trolley Type	Storage Battery Type	Total
1923	1,024	256	1,080
1924	428	144	572
1925	512	177	689
1926	653	218	871
1st half 1927	355	126	481

Prospecting by Radio Method Described in Pamphlet

The Radiore Company, 1204 Hollingsworth Building, Los Angeles, affiliated with the Southwestern Engineering Corporation, has just issued an interesting booklet on the Radiore process, an electrical method of locating sulphide orebodies and other electro-conductors. This brochure contains general information and a more complete outline for those technically inclined. Copies of the publication may be had on application to the company.

NEW CATALOGS

PORTABLE HOISTS — Bulletin 76-F, Sullivan Machinery Co., Chicago. Turbinair portable hoists, types HA-4 and HA-2 single drum; type HDA-2 double drum. Pp. 16.

COMPRESSORS—Bulletin 83-F, Sullivan Machinery Co., Chicago. Portable air compressors, WK-312, WK-314, WK-322, and WK-324. Pp. 32.

AMMETERS—Catalog 1502, ammeter section, The Bristol Company, Waterbury, Conn. Recording ammeters. Pp. 32.

CONCENTRATING TABLES — Bulletin No. 18, Deister Concentrator Co., Fort Wayne, Ind. No. 6 Deister-Overstrom diagonal deck sand or slime table. Pp. 4.

ROCK DRILLS — The Cochise Rock Drill Manufacturing Co., Los Angeles. Cochise wet stoper, Model 4-W. Pp. 16.

TRANSMISSION — Bulletin No. 220. Chain Belt Co., Milwaukee, Wis. Rex chains and transmission equipment. Pp. 140, illustrated.

SPEED TRANSMISSION — Stephens-Adamson Mfg. Co., Aurora, Ill. Variable speed transmission. Pp. 4.

CONVEYORS—Bulletin No. 615. Link-Belt Company, Chicago. Belt conveyor data. Pp. 144.

DIESEL ENGINES — Bulletin S-173, Worthington Pump & Machinery Corporation, New York. The Worthington double-acting, two-cycle Diesel engine. Pp. 28.

DIESEL ENGINES—Catalog F, Bethlehem Steel Co., Bethlehem, Pa. Diesel engines of the two-cycle airless injection type for stationary service. Pp. 22.